AAAS AND EVOLUTION • THE 'NEW' IDOLATRY • THE 'CORAL CASTLE' MYSTERY

Skeptical Inquirer

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Editor's Note

Are We Alone? A Searching Look at SETI

Are we alone in the universe? The question reverberates across the centuries. But the generations alive today are the first to be able to actively seek an answer. The scientific Search for Extraterrestrial Intelligence (SETI) has been underway since the 1960s and 1970s when the ability to scan the skies with powerful radiotelescopes and the activities of SETI pioneers such as Frank Drake and Carl Sagan began to breed optimism that we might soon have an answer. Peter Schenkel, who once shared that optimism and wrote two books on SETI, one a novel about first contact that I enjoyed, thinks it's time for a skeptical reassessment of SETI, and he provides it in this issue.

I share the popular fascination with the question. It has profound significance for science and humanity. Science books I have on SETI fill an entire shelf. I myself first wrote about SETI and its possible consequences in "First Contact: The News Event and the Human Response," a chapter in the 1976 Prometheus book *Extra-Terrestrial Intelligence: The First Encounter*, edited by James L. Christian. I have since become a bit more circumspect about the possibilities but no less enthusiastic about the question.

That's why I invited three distinguished experts on SETI and the broader new discipline of astrobiology to respond to Schenkel's critique and provide their own brief appraisals of the status of the search. Astronomer (and CSICOP Fellow) Jill Tarter leads the search as director of the Center for SETI Research at the SETI Institute, the privately funded research group in Mountain View, California. NASA planetary scientist David Morrison (also a CSICOP Fellow) has helped define astrobiology and is at the NASA Astrobiology Institute. Astronomer/writer David Darling's book *Life Everywhere* explores astrobiology, and he has also written a lively alphabetical guide on everything to do with life in the universe, *The Extraterrestrial Encyclopedia.*

I think these four points of view make for an up-to-date and highly readable reassessment of the status of the scientific search for intelligent life elsewhere.

* * *

The Princeton Engineering Anomalies Research (PEAR) group has for years made claims of the mind's abilities to affect the output of a random number generator. In this issue, York University physicist Stanley Jeffers provides a succinct analysis that casts a considerably different light on these assertions.

* * *

April 30 marks the thirtieth anniversary of the founding of CSICOP at a landmark conference "The New Irrationalisms: Antiscience and Pseudoscience," organized by Paul Kurtz at the State University of New York at Buffalo. Later that same year, 1976, the first issue of the SKEPTICAL INQUIRER (initially called *The Zetetic*) came out. As I write, I'm on my way to a celebration of CSICOP's anniversary and dedication of the new wing of the Center for Inquiry, headquarters for CSICOP and the Council for Secular Humanism, virtually across the street from the campus where this global effort in the defense of science and reason all started thirty years ago. It has been an exciting thirty years. I think we have made a difference, and with your continuing involvement and support we will keep doing so in the years and decades ahead.

Skeptical Inquirer

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AAAS Events, Statement Expound Evolution, Decry ID

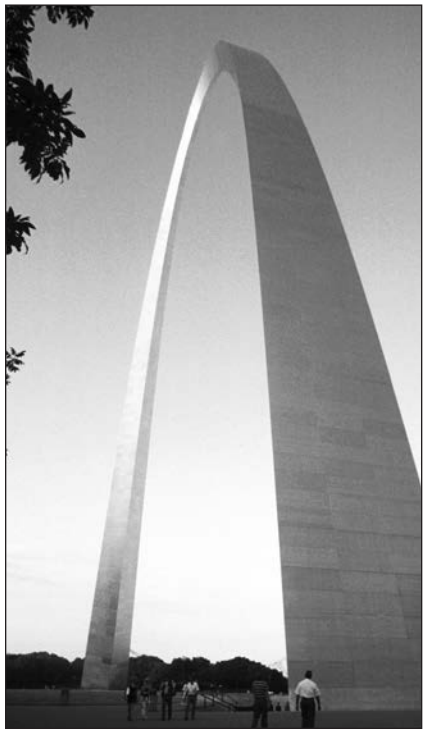
KENDRICK FRAZIER

If this year's meeting of the American Association for the Advancement of Science is any guide, no one can complain any longer that the scientific community is ignoring the creationist assaults on evolution. The 2006 AAAS annual meeting, held February 16–20 in St. Louis, featured at least three symposia on the topic, a news conference, a new AAAS film, an afternoon-long "Evolution on the Front Line" event for teachers, and a strong new statement from the AAAS Board of Directors denouncing attempts in state legislatures to undermine evolution.

AAAS President Gilbert S. Omenn and AAAS CEO and *Science* magazine executive publisher Alan I. Lescher were much in evidence at these events, indicating the issue's high-level attention within the world's largest general scientific organization.

Coming less than two months after U.S. District Judge John E. Jones's momentous ruling declaring intelligent design "not science" but "creationism in disguise" and its inclusion in science classrooms unconstitutional (SI, March/April), the multiple AAAS pro-evolution events hint that science may at last have regained important momentum in the latest phase of the evolution/creation battles. After years of weakly rebutted public hype about intelligent design, those who support good science and education may at last have regained the upper hand.

As a result of Judge Jones's pro-evolution decision in the Dover, Pennsylvania, case, "I think it is safe to say that as a legal strategy, intelligent design is dead," said CSICOP Fellow Eugenie Scott, director of the National Center for Science Education, at a standing-room-only symposium titled "Science Under

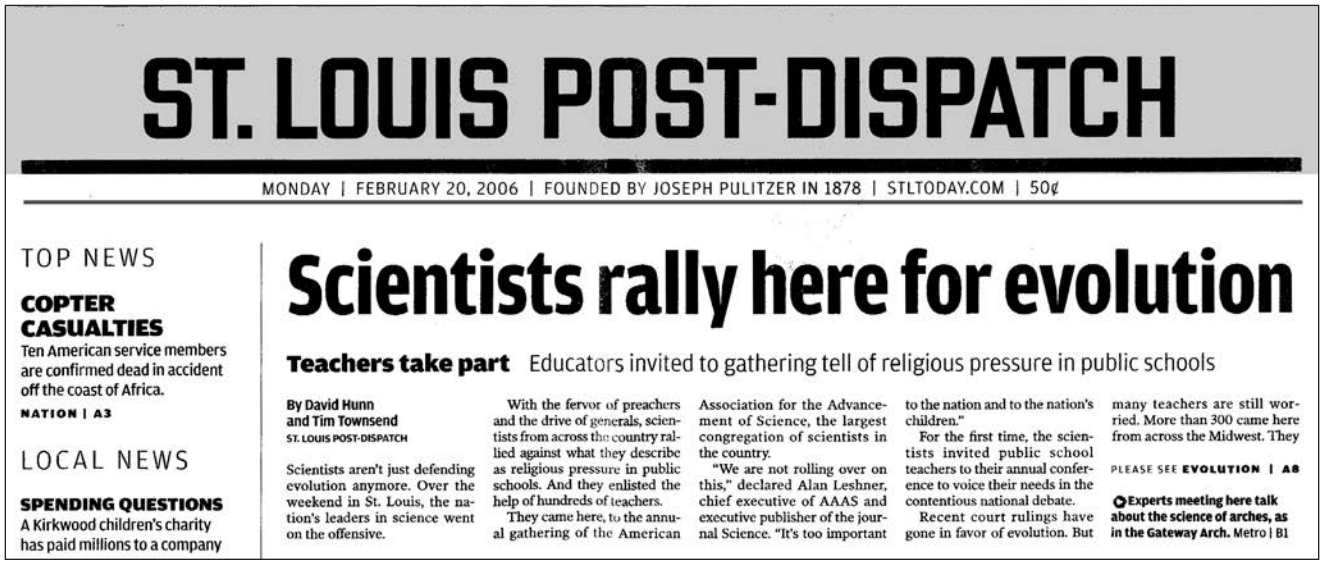


AAAS: 'Deeply Concerned about Legislation and Policies That Would Undermine the Teaching of Evolution'

Here is the key portion of the new statement by the American Association for the Advancement of Science, issued at its annual meeting in St. Louis February 16, 2006:

"Evolution is one of the most robust and widely accepted principles of modern science. It is the foundation for research in a wide array of scientific fields and, accordingly, a core element in science education. The AAAS Board of Directors is deeply concerned, therefore, about legislation and policies recently introduced in a number of states and localities that would undermine the teaching of evolution and deprive students of the education they need to be informed and productive citizens in an increasingly technological, global community. Although their language and strategy differ, all of these proposals, if passed, would weaken science education. The AAAS Board of Directors strongly opposes these attacks on the integrity of science and science education. They threaten not just the teaching of evolution, but students' understanding of the biological, physical, and geological sciences. Some bills seek to discredit evolution by emphasizing so-called 'flaws' in the theory of evolution or 'disagreements' within the scientific community. Others insist that teachers have absolute freedom within their classrooms and cannot be disciplined for teaching non-scientific 'alternatives' to evolution. A number of bills require that students be taught to 'critically analyze' evolution or to understand 'the controversy.' But there is no significant controversy within the scientific community about the validity of the theory of evolution. The current controversy surrounding the teaching of evolution is not a scientific one. . . ."

The full statement is at: www.aaas.org/news/releases/2006/pdf/0219boardstatement.pdf.



ST. LOUIS POST-DISPATCH

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TOP NEWS

COPTER CASUALTIES
Ten American service members are confirmed dead in accident off the coast of Africa.
NATION | A3

LOCAL NEWS

SPENDING QUESTIONS
A Kirkwood children's charity has paid millions to a company

Scientists rally here for evolution

Teachers take part Educators invited to gathering tell of religious pressure in public schools

By David Hunn and Tim Townsend
ST. LOUIS POST-DISPATCH

Scientists aren't just defending evolution anymore. Over the weekend in St. Louis, the nation's leaders in science went on the offensive.

With the fervor of preachers and the drive of generals, scientists from across the country rallied against what they describe as religious pressure in public schools. And they enlisted the help of hundreds of teachers.

They came here, to the annual gathering of the American Association for the Advancement of Science, the largest congregation of scientists in the country.

"We are not rolling over on this," declared Alan Leshner, chief executive of AAAS and executive publisher of the journal Science. "It's too important to the nation and to the nation's children."

For the first time, the scientists invited public school teachers to their annual conference to voice their needs in the contentious national debate.

Recent court rulings have gone in favor of evolution. But many teachers are still worried. More than 300 came here from across the Midwest. They

PLEASE SEE EVOLUTION | A8

Experts meeting here talk about the science of arches, as in the Gateway Arch. Metro | B1

Attack." Nevertheless, she cautioned that the intelligent design movement is far from going away and that it likely "will evolve" soon into something else.

At a later news conference she called Dover "a stunning defeat for intelligent design" but again emphasized, "It is not dead as a social movement." She predicted that because intelligent design requires "a designer" that can only be "God," which is not allowed in the classroom, the movement would come up with some sort of "agentless design" idea. Terms like "sudden-emergence theory" or "creative" evolution are being heard. Or, she said, the IDers may just resort back to "denigrating evolution."

Education is enormously decentralized in the United States, she pointed out, with 17,000 independent school districts. This helps explain the diverse local battles over science education standards. If those standards include evolution, students are going to be tested on it; if they are going to be tested on evolution, evolution is going to be taught. "That's why the [creationists'] fight is against the standards."

As a result, anti-evolution laws are pending in the legislatures of fourteen states, and these are what drew the AAAS Board of Directors' ire. In a statement released by Omenn, a professor of medicine and genetics at the University of Michigan, the AAAS Board denounced "legislation and policies" that would undermine the teaching of evolution and weaken science education. The laws would "deprive students of the education they would need to be informed and productive citizens in an increasingly technological, global community."

The statement noted pending anti-evolution laws in Alabama, Arkansas, George, Kansas, Michigan, Mississippi, Missouri, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, and Utah.

"The AAAS Board of Directors opposes these attacks on the integrity of science and science education," Omenn said. "They threaten not just the teaching of evolution, but students' understanding of the biological, physical, and geological sciences."

At the news conference, Omenn said such legislative attempts "confuse what is science and what is not science."

In another indication of foreign puzzlement about the creationist movement in America, a European reporter asked why the scientific community was responding only now. Omenn noted that there have been two National Academy of Sciences reports for the public and teachers over the years, that virtually every scientific organization in the world has issued statements, and that the new AAAS statement was only its most recent supporting evolution and denouncing creationism. (See "AAAS Board Urges Opposing Intelligent Design Theory," SKEPTICAL INQUIRER, March/April 2003.) He wryly pointed out that the first AAAS statement was in 1922, and it "was almost the same as today's."

He called the current time "a teachable moment"—a good opportunity to teach "the value of scientific ways of thinking."

AAAS's Evolution on the Front Line event for science teachers was organized in collaboration with more than thirty scientific and educational organizations, including the Geological Society of America. "We want to give local teachers a voice in the evolution issue and show that we stand behind them," Omenn said in the preceding news conference.

Held in the large Ferrara Theater in the Americas Center on a Sunday afternoon, the 'Front Line' event began with a new AAAS film about science and religion emphasizing that evolution is strongly supported by scientific evidence and that religion and science need not be incompatible.

Eight teachers from the embattled school districts in Dover, Pennsylvania, and Cobb County, Georgia, were

Eugenie Scott (at far right), CSICOP Fellow and executive director of the National Center for Science Education, speaks at the AAAS news conference in St. Louis about "Evolution on the Front Line." Other participants are, from left, AAAS President Gilbert Omenn; Rep. Russ Carnahan (D-Mo.); Jeff Corwin, host of Animal Planet's *Corwin's Quest*; and Vatican Observatory Director and cosmologist the Rev. George V. Coyne.

brought to the event and honored with a standing ovation for their courage in resisting introduction of nonscientific concepts in their science classrooms.

A National Science Teachers Association survey last year showed that nearly one-third of 1,050 respondents said they feel pressured to include creationism, intelligent design, or other nonscientific alternatives to evolution in their science classrooms.

Teachers in the audience, through real-time electronic voting, were able to choose their top four challenges to teaching evolution. The four selected were the need for good talking points on the subject, concerns about how best to frame the issue, objections from parents and students, and their own rusty knowledge.

One of the event's participants was the Rev. George V. Coyne, an astrophysicist and director of the Vatican Observatory. Coyne titled his talk "A Catholic scientist looks at evolution," but in the preceding news conference he said, "There is no such thing as a Catholic scientist. Science is absolutely neutral when it comes to religion."

Coyne said the intelligent design movement belittles God. "God is not an engineer who designed the universe," he said.

A cosmologist, he reviewed the 13.7-billion-year history of the universe with its 10^{22} stars. He scorned those who take the Bible as literal truth about science. "Science didn't exist when the scriptures were written," he said.

As for papal utterances, in the news conference Coyne noted that Pope John Paul II had said evolution was no longer a mere hypothesis but the best explanation for understanding life on Earth. Coyne said as far as he can tell the new Pope Benedict "has followed this whole line of reasoning."

Kendrick Frazier is the editor of the SKEPTICAL INQUIRER *and a newly inducted Fellow of the AAAS.*

U.S. 'Out on a Limb by Ourselves' in Evolution Rejection, Jon Miller Tells AAAS

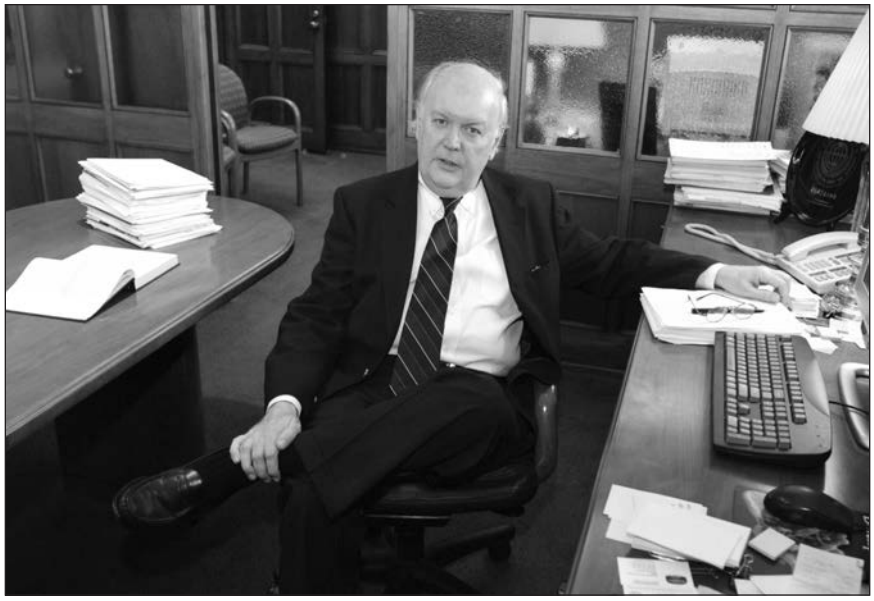
Americans do embrace science and technology, says Jon D. Miller of Northwestern University—with the notable exception of evolution.

Miller and his colleagues, and others before them, have carried out formal surveys over the years that continue to demonstrate a strong belief in the promise of science to make our lives healthier, easier, and more comfortable. In that regard, says Miller, "There's a high amount of support for science and technology." Ninety-two percent of adults, for instance, when asked, "Is the world better off or worse off because of science?" answer yes. Eighty-eight percent expressed the same view after Sputnik fifty years earlier.

But reservations about the pace of change brought about by science and conflicts with traditional religious beliefs trouble large proportions of the public. Fifty percent agree that "we depend too much on science and not enough on faith," for instance.

It's when you get specifically to evolution-related issues that the trouble begins in the U.S., Miller said. To the question, "Human beings . . . developed from earlier species of animals," those answering "accept" have declined from 45 to 40 percent in the past twenty years. Those who "disagree" declined even more, but those who are "not sure" increased dramatically, from 7 percent in 1985 to 21 percent in 2005.

If you add the adjective "definitely" before each question, only 12 percent say evolution is definitely true, and 32 percent say evolution is definitely not true, Miller reported in the "Science Under Attack" session at the AAAS meeting.



Northwestern University researcher Jon Miller. Photo: Steve Kagan

"The roughly even division of the American public on evolution is disappointing," he told the AAAS audience.

The distrust of evolution is almost entirely an American phenomenon. "We are out on a limb by ourselves," Miller says.

Polls in thirty-four countries about acceptance of evolution show the United States virtually at the bottom. Only Turkey—which has its own brand of Muslim creationism, Miller pointed out—shows lower rates of acceptance of evolution. Eighty percent or more of adults in Iceland, Denmark, Sweden, and France accept evolution, Miller reported. Japan, Britain, Norway, Belgium, Spain, and Germany all have better than 70 percent acceptance rates.

American fundamentalism and its differences from European Protestantism are at the root of the discrepancies, Miller says. And the problem is seriously exacerbated at the moment by what he calls "politicalization by conservative Republicans for partisan political issues purposes." Says Miller: "Creation science has become a political platform. It is good for primaries, if not good for November. It drives out the moderates."

What do we need to do about it? Miller says we need to learn the rules of the political game, work within both political parties ("many Republicans are appalled by the capture of the Republican party by religious fundamentalists"), and fix high school education, which, he says, "is broken."

In contrast, he says, a bright spot is that at the university level, "We are the only major nation that requires all students to take general education requirements, including science." Forty percent of Americans take a college-level science course. There, he said, is our chance to reach future lawyers, congressmen, and presidents.

—Kendrick Frazier

Neil deGrasse Tyson to Host *NOVA scienceNOW*

Astrophysicist and CSICOP Fellow Neil deGrasse Tyson has been named to host the PBS television science magazine series *NOVA scienceNOW*. Tyson is director of the Hayden Planetarium in the Rose Center for Earth and Space Science at the American Museum of Natural History. He succeeds departing first-season host Robert Krulwich, who is moving on to National Public Radio.

NOVA scienceNOW is a quarterly hour-long science news magazine launched by NOVA in January 2005. Tyson previously hosted the 2004 PBS series *Origins* and was a featured scientist on several 2005 episodes of *NOVA scienceNOW*.

"We are thrilled to have Neil deGrasse Tyson on the *NOVA scienceNOW* team," Paula Apsell, the senior executive producer, said. "Neil's scientific background and the passion he brings to his work complement perfectly the series' commitment to reporting the most astonishing stories from the frontlines of science-in-process."

Tyson, author of seven science books, including *Just Visiting This Planet* and *The Sky Is Not the Limit: Adventures of an Urban Astrophysicist,* said, "*NOVA scienceNOW* is the only show on television that presents cutting-edge science stories in this exciting and fresh magazine format, and I relish the challenge of making science accessible and relevant to many different audiences."

Neil deGrasse Tyson

Studies on Soy and Arthritis-relief Supplements Give Negative Results

Recent studies have cast doubt on the purported benefits of soy and glucosamine supplements. The Nutrition Committee of the American Heart Association (AHA) has released a statement indicating that soy and soy-based products, such as soy milk, tofu, vegetarian meat substitutes, and supplements containing soy, may not be as helpful in the fight against unhealthy levels of cholesterol as had been hoped.

A panel set up by the Nutrition Committee reviewed studies that were conducted over the past ten years and concluded that the findings of those investigations did not support the claim that a diet consisting of twenty-five grams or more of soy protein could lower cholesterol for the average person. A journal report from the AHA states that "large amounts of soy protein in the diet reduced low-density lipoproteins (LDL), or 'bad cholesterol,' only 3 percent and had no effect on high-density lipoproteins (HDL), or 'good cholesterol.'" This is a significantly smaller effect than had been expected—and less than what's advertised for many soy products. Similar results were obtained in the committee's review for soy isoflavones, molecular compounds that are found in soy.

In 2000, a statement released by the same committee recommended the addition of soy proteins to a diet that's low in saturated fats and cholesterol as a way to combat heart disease.

The Food and Drug Administration may alter its rules in response to this study, no longer allowing manufacturers of soy products to claim cholesterol reduction in advertising or on packaging.

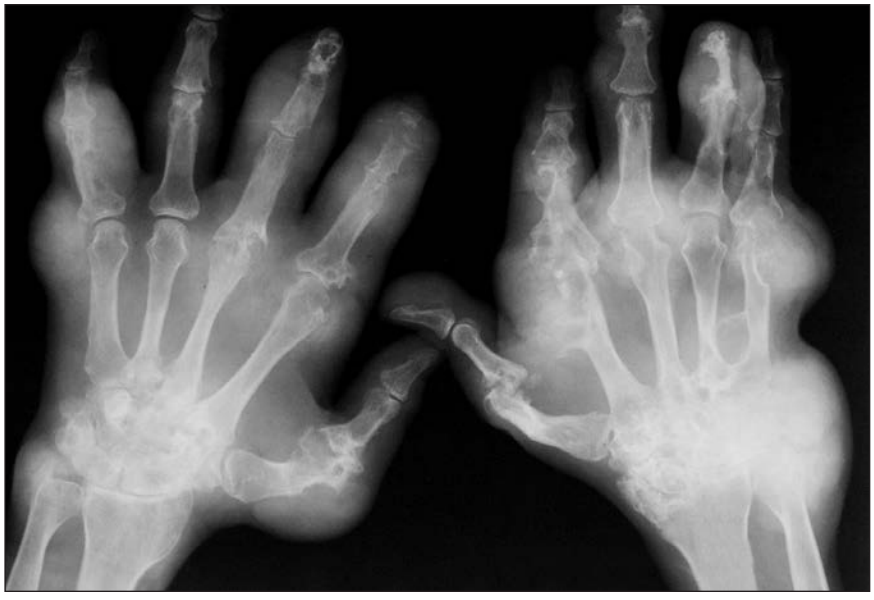
The report notes that many people who regularly consume soy and soy-based products do so to substitute soy proteins for those found in less healthy fare and that this is good, but other benefits are not what had been hoped for. Frank M. Sacks, M.D., a member of the panel that released the statement, said: "Soy products may have other benefits when replacing foods such as hamburgers. Soy products have no cholesterol or saturated fats and have high amounts of fiber."

The statement, "Soy Protein, Isoflavones, and Cardiovascular Health: An American Heart Association Science Advisory for Professionals from the Nutrition Committee," appears in the AHA's journal, *Circulation*, volume 113, issue 7 (February 21, 2006), and was authored by Frank M. Sacks, Alice Lichtenstein, Linda Van Horn, William Harris, Penny Kris-Etherton, and Mary Winston for the American Heart Association Nutrition Committee.

And a team of researchers, led by Daniel O. Clegg of the University of Utah School of Medicine, has published the results of a nearly four-year study of the effectiveness of the popular supplements chondroitin and glucosamine in the treatment of osteoarthritis of the knee. Their findings: reported relief of symptoms in the groups that received the two supplements, separately or together, was not significantly higher than those of control groups that received celecoxib (a non-steroidal anti-inflammatory drug that's commonly prescribed for mild osteoarthritis) or a placebo. The only positive finding for the supplements was: "Exploratory analyses suggest that the combination of glucosamine and chondroitin sulfate may be effective in the subgroup of patients with moderate-to-severe knee pain."

GAIT (Glucosamine/chondroitin Arthritis Intervention Trial) was a multicenter, double-blind study, using 1,583 patients who reported pain from osteoarthritis of the knee. Each participant received either glucosamine sulfate,

Products made from soybeans are said to heal.



Glucosamine supplements may not help arthritic hands such as these.

REACH OUT TO A NEW FUTURE!

CENTER FOR INQUIRY
Transnational

New Future Fund

This phase of the campaign spotlights a family of high-impact projects.

As construction of the Center for Inquiry–*Transnational* expansion is completed, we turn to new challenge goals in our multi-year, $26.26 million **New Future Fund** campaign.

The **New Future Fund** is an ambitious campaign to support the Center for Inquiry, the Committee for the Scientific Investigation of Claims of the Paranormal, and the Council for Secular Humanism through endowment funding and support for expanded programming. The **New Future Fund** was launched after thorough study, and its goals reflect needs judged indispensable if the Center for Inquiry is to continue serving society as the leading champion of reason, scientific naturalism, and humanist values.

Opposing Creationism/ Intelligent Design

Intelligent design (ID) theory is creationism's new face, sparking some 70 new controversies in an astonishing *26 states*. CSICOP is gearing up to **fight back** with grassroots outreach to mobilize skeptics at the local level when ID proposals loom; a stimulating new Web site, www.csicop.org/creationwatch; and media outreach, from new literature to books to top-shelf online columnists.

As ID advocates plan to shoulder Darwin and the scientific viewpoint out of public schools, the **New Future Fund** helps CSICOP say **no!**

The Center for Inquiry has obtained United Nations recognition as a nongovernmental organization (NGO), opening new avenues for activism and human enrichment.

The Center for Inquiry presses for humanism, science, and reason worldwide. Centers for Inquiry have been established in Argentina, China, Egypt, France, Germany, India, Nepal, Nigeria, Peru, Russia, and elsewhere, pursuing regionally tailored agendas.

The Center and its affiliates have facilitated international meetings of humanists and skeptics for more than two decades. Your gift to the **New Future Fund** will help this transnational expansion continue.

Outreach

The Center for Inquiry movement began with publishing, still essential to our mission. *Skeptical Inquirer* and *Free Inquiry* headline a family of magazines in three languages, newsletters, and Web sites. Professional public education and media relations further amplify our message. Campus outreach presents our message of science and reason to the leaders of tomorrow.

Your gift to the **New Future Fund** can help to support core publishing outreach (this issue of *Skeptical Inquirer* is four pages longer than early-2005 issues, thanks to support from the **New Future Fund**), fuel our exploitation of new communications technologies, and fund more aggressive on-campus programs. The **New Future Fund** is key to the future promotion of skepticism, science, reason, and humanism by the Center for Inquiry and its affiliates.

Your gift to the **New Future Fund** can support these and other urgent priorities. We gratefully accept gifts of cash, publicly traded securities, paid-up insurance policies, and other assets. We are pleased to offer attractive incentive and naming opportunities to honor major contributors. All gifts are fully tax-deductible as provided by law. Campaign personnel are available to meet with donors to provide updates on our plans and to discuss other commemorative opportunities tailored to particular needs and interests.

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Center for Inquiry–*Transnational*
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(716) 636-4869, ext. 427
E-mail: development@centerforinquiry.net
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Please join us and declare your support today. Write, call, e-mail, or return the bound-in postcard (at right) today!

The Center for Inquiry, the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), and the Council for Secular Humanism are 501(c)(3) tax-exempt charitable organizations.

chondroitin sulfate, a combination of the two compounds, celecoxib, or a placebo. The outcome that was sought was a 20-percent decrease in pain in the affected joint over the twenty-four-week study period. The patients' mean age was fifty-nine years and the female-to-male ratio was sixteen to nine.

These results could have a broad impact, considering that twenty million people in the United States alone suffer from osteoarthritis. And that number is expected to increase in coming decades, as the Baby Boom generation comes into its arthritis-prone years. The government estimates that $86 billion dollars was spent on arthritis treatment in 2004, and the nutrition industry states that Americans spent $730 million on glucosamine and chondroitin in that same year. The investigators admit that the study had a number of limitations, and further investigations will be needed to determine its accuracy and relevance. (Even the potentially positive findings for the moderate-to-severe-pain group are somewhat mitigated by the small sample size of that category in the study.)

GAIT was funded by the National Center for Complementary and Alternative Medicine (NCCAM) and the National Institute of Arthritis and Musculoskeletal Diseases (NIAMD), which are both divisions of the National Institutes of Health (NIH), and was published in *The New England Journal of Medicine* (volume 354, number 8 [February 23, 2006]).

—David Park Musella

David Park Musella is an editorial assistant with the SKEPTICAL INQUIRER.

James Randi's Amazing Meeting in Las Vegas

James Randi's fourth annual "Amazing Meeting" was held in Las Vegas, Nevada, January 27–29, 2005. About 800 participants showed up at the Stardust hotel to hear more than a dozen speakers, including noted writer Christopher Hitchens, American Civil Liberties Union president Nadine Strossen, Nobel Laureate Murray Gell-Mann, philosophy professor Daniel Dennett, comedian/magician Penn Jillette, and the stars of the popular Discovery Channel television show *Mythbusters*. Other speakers included "The Bad Astronomer" Phil Plait, British psychologist Richard Wiseman, and space scientist Carolyn Porco.

The title of the conference was "Science in Politics and the Politics of Science." Topics included Thomas Jefferson's view of the Bible, intelligent design, the evolution of religion, astronomy, and the politicization of science. On the final day, a dozen papers were presented, including lectures by CFI–*West*'s Jim Underdown on investigations, Benjamin Radford on psychic detectives, and CSICOP Fellow David Thomas on the Bible Code.

The conference was notable for its large attendance (the star speakers and the exciting location probably helped), and also its significant female attendance: about a third of the audience was women. Several magicians and comedians added to the fun, making sure that while the topics were serious, the tone was positive and lighthearted. Overall it was an excellent conference, and demonstrated that skepticism can be popular if presented in an interesting manner.

—Benjamin Radford

Benjamin Radford is the managing editor of SKEPTICAL INQUIRER.

"The Amazing" Randi addresses an enthusiastic crowd at his conference.

Skeptical youth at the conference included (from left) Dave Hawley, Kristof Verhoeven, Rebecca Watson, and Matt Fiore.

Darwin's Birthday, Hollywood Style

At 12:01 A.M. on February 12, 2006, Center for Inquiry–*West* Executive Director James Underdown began reading page one of the *Origin of Species* at the CFI in Hollywood. Eighteen and a half hours (and sixty readers) later, actress/writer Julia Sweeney read the final pages of Charles Darwin's conclusion to a crowd of eighty cheering supporters of science.

Since Darwin's Theory of Evolution has been under such attack over the past few years, the CFI–*West* staff wanted to make a statement on a scale befitting the revolutionary nineteenth-century scientist. So Chief Operating Officer Bob Ladendorf came up with the idea to read the whole book . . . aloud.

Invitations went out to dozens of writers, scientists, and performers. The response was immediate and overwhelming. When word spread that the Center was looking for people to read Darwin, the morning and afternoon reading slots were gobbled up in short order. Ann Druyan and Ed Begley Jr. sent their regrets, but many well-respected names were able to participate.

Authors who read included M.G. Lord, Aimee Bender, Judith Freeman, and Margaret Wertheim. We saw screenwriter Robin Swicord (*Memoirs of a Geisha*) and TV writers Mike Reiss (*The Simpsons),* Alan Katz *(M*A*S*H)*, and Jay Kogen (*Fraser*). Academy Award nominee Robert Forster read, as did film directors David Twohy, Stephen Vittoria, and Jonathan Lynn.

Distinguished professors and scientists on hand included Leo Braudy of USC, Joe Manson of UCLA, Alan Harris of the Space Science Institute, and David Pieri of the Jet Propulsion Laboratory.

The festivities celebrating Darwin's 197th birthday included cake, food, music, and a diaper-clad spider monkey. Well over a hundred people attended the nineteen-hour event.

The Center for Inquiry thanks all who attended, with special gratitude to all the readers—famous or not—who took the time to read from the *Origin of Species.*

—James Underdown

James Underdown is Executive Director of the Center for Inquiry/West.

Robert Forster, Julia Sweeney, and James Underdown celebrate Darwin Day.

Author M.G. Lord reads at CFI/West's Darwin Day celebration.

Irving Rothchild Dead at 92

Irving Rothchild, a retired professor from Case Western Reserve's medical school and a world authority on reproduction, died January 9, 2006, at his home in Cleveland Heights, Ohio, at the age of 92. He had doctorates in both zoology and medicine. Rothchild wrote "The Intelligent Designer," a poem published in the SKEPTICAL INQUIRER'S special Evolution and the ID Wars issue (November/December 2005). "The Intelligent Designer" is one of 90 poems nominated for the Rhysling Prize and will be reprinted in the Rhysling Anthology, probably next year. A short excerpt also appeared in the *Cleveland Plain Dealer's* obituary article.

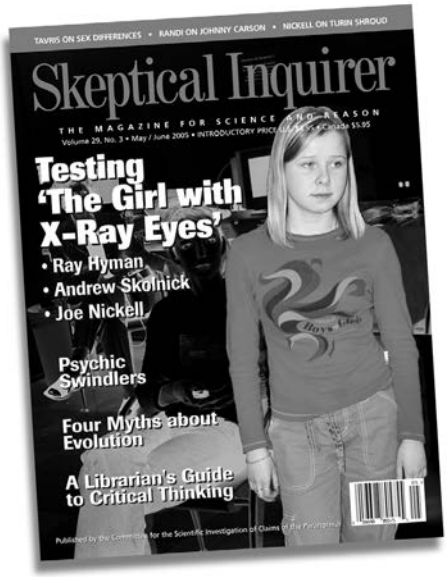
CSICOP Announces Winners of the First Robert P. Balles Prize

CSICOP is pleased to announce the winners of the first Robert P. Balles Annual Prize in Critical Thinking, sponsored by the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP).

The Robert P. Balles Annual Prize in Critical Thinking is a $1,000 award that is given to the author of the published work that best exemplifies healthy skepticism, logical analysis, or empirical science. Each year, CSICOP will select the paper, article, book, or other publication that, in its judgment, has the greatest potential to create positive reader awareness of currently important scientific concerns. CSICOP established criteria for the prize, including use of the most parsimonious theory to fit data or to explain apparently preternatural phenomena.

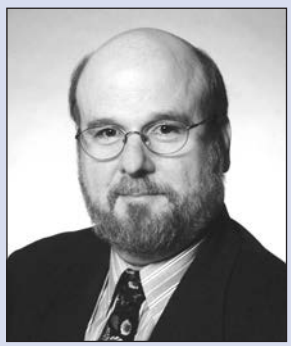
This prize has been established through the generosity of Robert P. Balles, an Associate Member of CSICOP, and the Robert P. Balles Endowed Memorial Fund, a permanent endowment fund for the benefit of CSICOP.

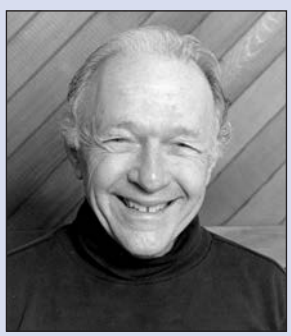
For 2005, the Robert P. Balles prize will be shared by Ray Hyman, Andrew Skolnick, and Joe Nickell for their series of articles in the May/June 2005 issue of the SKEPTICAL INQUIRER, called "Testing the Girl with X-ray Eyes," specifically, "Testing Natasha," by Ray Hyman; "Natasha Demkina: The Girl with Normal Eyes," by Andrew Skolnick; and "Second Sight: The Phenomenon of Eyeless Vision," by Joe Nickell.


TAVRIS ON SEX DIFFERENCES • RANDI ON JOHNNY CARSON • NICKELL ON TURIN SHROUD
Skeptical Inquirer
THE MAGAZINE FOR SCIENCE AND REASON
Testing 'The Girl with X-Ray Eyes'
• Ray Hyman
• Andrew Skolnick
• Joe Nickell
Psychic Swindlers
Four Myths about Evolution
A Librarian's Guide to Critical Thinking

Runners-up to the articles by Hyman, Skolnick, and Nickell included the book *Abducted: How People Come to Believe They Were Kidnapped by Aliens*, and Judge John E. Jones III's landmark decision in the case of parents Tammy Kitzmiller, et al. against the Dover, Pennsylvania, Area School District, in which the judge ruled that teaching intelligent design as science is unconstitutional.

Nominations are now being accepted for 2006. Please send submissions to: Barry Karr, Executive Director, CSICOP, P.O. Box 703, Amherst, NY 14226-0703. □


Andrew Skolnick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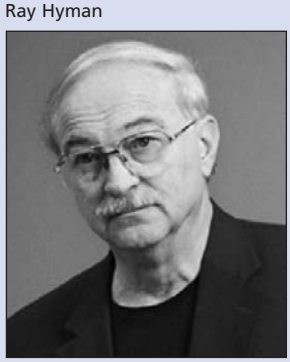
Joe Nickell

Public Health's Credibility Crisis

ELIZABETH M. WHELAN

As society grapples with a possible avian influenza epidemic, threats of biological and chemical terrorism, AIDS, cigarette smoking, drug abuse, obesity, and more, it is vital that public health professionals present reliable scientific information and that the credibility of the public health profession be beyond reproach.

In recent years, however, a worrisome trend has emerged: Many in the public health community appear to be promoting politics and ideology over sound science. The slippage of public health science into pseudoscience and agenda-driven initiatives has been going on for some time. The problem was addressed in a 1998 article by the Manhattan Institute's Heather Mac Donald. She noted that the field of public health "increasingly identifies itself by the most radical elements within it," noting that meetings of the American Public Health Association feature speakers like Jesse Jackson and promote caucuses on everything from socialism to lesbian/gay and bisexual rights. Mac Donald decries the drift of the public health community from programs based on sound epidemiological science (with a focus on preventing premature deaths from established causes like cigarette smoking) to the pursuit of agendas related to fighting poverty, racism, and sexual discrimination. She laments the flight of public health from sound science, noting that this evolution "squanders the great legacy of public health."

Elizabeth M. Whelan, Sc.D., MPH, is president of the American Council on Science and Health (ACSH.org; HealthFactsAndFears.com).

Last year, the credibility of the public health profession came even more sharply under scrutiny—and Mac Donald's predictions about the erosion of public health as a respected and legitimate profession seem more on target than ever before.

Specifically, two major public health institutions selected for their highest awards individuals whose focus in public health was not traditional preventive medicine interventions (for example, promoting immunizations, smoking cessation, disease screening, etc.). Instead, the award recipients' practice of "public health" focused on litigation against corporations. The message emerging from these awards is this: lawsuits against corporations, whether it means suing a soda company to hold it accountable for childhood obesity or litigating against a chemical company for allegedly causing cancer, are now accepted as standard public health practice—as important or more important than traditional public health educational and service programs based on epidemiological findings about the causes of human disease.

The first of these two awards, the Sedgwick Memorial Medal, described by the American Public Health Association as its "oldest and most prestigious award," was given to Dr. Barry Levy in December 2005. The APHA reserves this award for "an individual who has demonstrated a remarkable record of service while working to further public health practice and knowledge." What remarkable public health achievements by Dr. Levy singled him out for this award? Did he promote water fluoridation? Establish smoking cessation clinics? Advocate more widespread influenza vaccinations? Increase the use of lifesaving seatbelts and bike helmets? Encourage people to eat less and exercise more? No, not exactly. Dr. Levy may be best known as being one of nine physicians who are at the center of a growing scandal over silicosis and asbestos diagnoses in the course of litigation against corporations.

At one point, it was revealed that Dr. Levy produced over 1,200 "diagnostic evaluations" in seventy-two hours, that being a rate of about one diagnosis every four minutes. The clinical criteria for diagnosing silicosis, among other factors, requires: evidence of significant exposure to the substance over a substantial number of years, radiographic evidence of disease, and confirmation of the absence of any other causes of the condition. These criteria were not met by the physicians making the silicosis diagnoses. Specifically, Dr. Levy was accused by Judge Janis Graham Jack, in the course of his role in Texas silicosis litigation, of having "an agenda: diagnose silicosis and nothing else." The judge wrote that Dr. Levy "saw his role with respect to these cases as beginning and ending with litigation." Judge Jack ultimately blasted the diagnosing physicians, including Dr. Levy, asserting that their "diagnoses were driven by neither health nor justice: they were manufactured for money."

As summarized in a *Wall Street Journal* editorial, "The problem is that over the years, as Judge Jack's opinion shows, litigation has turned into a lucrative industry and some doctors have compromised their professional ethics in the process. This has profound consequences . . . in the area of 'public health' for which Dr. Levy is being honored. As Judge Jack noted, sham diagnoses have huge consequences for the unfortunate individuals who are pulled into these suits. The vast majority are in fact healthy but are saddled with 'diseases' that drive up premiums on their health and life insurance . . . they must deal with the wrenching emotional toll of being told (falsely) that they have a serious illness."

The bottom line is that Dr. Levy's participation in what the judge deemed to be sham diagnoses to support litigation did nothing to improve the state of public health. But APHA still felt he was worthy of the organization's highest award.

Erin Brockovich's Prize for Fighting

At least Levy has been an adjunct professor at Tufts and worked at the Centers for Disease Control, though. The second award that raised questions about public heath credibility was more ridiculous.

The Harvard School of Public Health (HSPH) bestowed its 2005 Julius Richmond Award, the school's highest honor, upon environmental activist Erin Brockovich. Since HSPH notes that the award "seeks to pay tribute to individuals who—like Dr. Richmond—have promoted and achieved high standards for public health," we must ask, as we did with Dr. Levy, what Brockovich accomplished in the field of public health and disease prevention to merit this prestigious award. (The award is named after the Surgeon General during the Carter administration.)

During the 1990s, Erin Brockovich worked as a file clerk for a California law firm. She ascertained that a Pacific Gas and Electric (PG&E) plant in Hinkley, California, was leaching trace levels of chromium 6, a rust inhibitor, into Hinkley's water supply and speculated that this exposure might be making local residents sick. She gathered health records and, working with her legal colleagues, identified some 600 prospective plaintiffs to sue PG&E, claiming exposure to chromium 6 caused a spectrum of diseases ranging from nosebleeds to breast cancer, Hodgkin's disease, miscarriages, and spinal deterioration. In 1996, PG&E settled the case for $333 million, ostensibly to compensate "victims." (The story was later portrayed in a motion picture starring Julia Roberts.)

There was never any evidence to support Ms. Brockovich's claim that traces of chromium 6 made people sick. The Environmental Protection Agency does consider chromium 6 a human carcinogen, but it's linked to lung cancer only when it is inhaled (not ingested) in high doses, over many years in occupational settings. A 2001 report by the California Department of Health Services, addressing the cancer claim of plaintiffs' lawyers, concluded: "We found no basis in either the epidemiological or animal data published in the literature for concluding that orally ingested chromium 6 is a carcinogen." For what was tantamount to a corruption of science, the attorneys received $133 million in fees; Ms. Brockovich received over $2 million as a "consultant."

In other words, Erin Brockovich received Harvard's highest accolade for her success in what the HSPH announcement called one of "the largest direct action lawsuits of its kind...where [the] giant utility paid one of the largest toxic tort injury settlements in United States history." She was honored for successfully suing a corporation that allegedly harmed the health of Hinkley residents, even though there was never any evidence that the actions of the corporation caused any ill health whatsoever.

Given this, it is understandable Harvard received considerable criticism for choosing Brockovich as the awardee. While qualified, science-oriented public health professionals were saving lives and preventing premature illness—through educational programs on the dangers of smoking, the benefits of lifesaving technologies like seat-belts and bike helmets, the importance of early detection of disease, and more—an individual who never did anything to save lives and protect public health was feted as a public health heroine.When called upon to justify the award, the dean of HSPH, Dr. Barry Bloom, maintained that Brockovich was being honored for work "on behalf of all of us . . . especially the residents of Hinkley, California, whose health was adversely affected by toxic substances."

When challenged by critics of the award and reminded that there was no evidence at all that the health of residents was "adversely affected" by "toxic substances," Bloom defended his action, noting, "[T]here are always areas of causal uncertainty . . . but there . . . is also an urgency to prevent harm and protect the health of people." In referring to "areas of causal uncertainty," Dr. Bloom apparently meant "no causal link was found, but only suspected." If one is to interpret this explanation literally, it appears that Dr. Bloom was arguing that even if there is no evidence of a health threat, it is important to assume there is one—just in case—and take punitive action against those charged with "causing" the harm.

But such a definition of causality violates the basic scientific (and epidemiological) requirement that before one can identify cause and effect, one must identify a cause. Eschewing scientific rationale, Bloom apparently believes that mere allegation suffices to assign causation and condemnation—bringing us back to burning "witches." This hardly seems like the type of educational message one would expect to be communicated at an institution of higher learning in the field of public health.

Thousands of public health professionals are at this moment saving lives and preventing premature disease following sound scientific protocols, yet the American Public Health Association and Harvard singled out individuals who instead pursued self-serving financial opportunities through litigation. These awards have stirred controversy (a commentary on the Brockovich incident in *Science* magazine was titled "Toxic Award?") among scientists who fear the negative impact on public health credibility. And well they should. The APHA and Harvard awards to those whose public health "specialty" was litigation were egregious examples of poor judgment and, just as Heather Mac Donald wrote, an example of the public health field being dominated "by the most radical elements within it." The question is whether this poor judgment was a fluke or part of an ominous trend. It is time for all public health professionals to reflect upon exactly what should be the basis of our activities: lifesaving interventions based on sound, peer-reviewed science—or political activism and agenda-driven activities that do nothing to prevent premature disease and death.

Intelligent Design and the Workings of Science

MICHAEL FRIEDLANDER

Intelligent design (ID) was the loser in the court case involving the school board of Dover, Pennsylvania, but the campaign against evolution will surely continue until it reaches the United States Supreme Court. ID is a thinly disguised version of creation science, and we may expect future versions to be creatively camouflaged as a means of intruding this pseudoscientific Trojan horse into the curriculum wherever the conventional theory of evolution is discussed. The basic objective, disclaimers to the contrary, is to clothe a particular religious opinion with a mantle of science as a way of undermining the widespread acceptance of the idea of evolution.

For an example, we can look to Arkansas Bill 590 of 1981:

> An Act to require balanced treatment of creation-science and evolution-science in public schools. . . . Section 2: Prohibition against Religious Instruction. . . . Section 4: "Creation-science" means the scientific evidences for creation and inferences from those scientific evidences. . . . "Evolution-science" means the scientific evidences for evolution and inferences from those scientific evidences. . . .

This Act was signed into law by the Governor of Arkansas in March 1981, then challenged in a suit brought by the Rev. Bill McLean and others. In a judgment delivered in January 1982, U.S District Court Judge William R. Overton ruled for the plaintiffs, commenting that "No group, no matter how large or small, may use the organs of government of which the public schools are the most conspicuous and influential, to foist its religious beliefs on others."

The agencies through which the ID advocates have sought to act have included local school boards and state legislatures. The device chosen by ID supporters is to label evolution as "only a theory" and then to claim ID to be a viable, alternative scientific theory, worthy of discussion in science classes.

There are several fallacies in this argument. The content of science is decided by scientists alone and not by legislators. When adding to the body of scientific knowledge, scientists carry a burden of proof, to demonstrate the correctness of their measurements and to propose tests that may be applied to their proposed theories. We need to contrast this with the popular misconception that the scientific community has a burden of disproof each time it is confronted by challenges in the form of untestable assertions, such as ID. At issue, of course, is the distinction between science on the one hand, and nonscience or pseudoscience on the other.

If a pressure group is successful in imposing a requirement that discussion of creation science or intelligent design be included in the science curriculum, what is to stop another group from imposing discussion of some other fashionable or politically connected pseudoscience, such as Lysenko's theory of plant genetics? Once a mechanism has been established for this sort of *inclusion* of curricular material, what is to stop the *exclusion* of material that other groups might find objectionable? Evolution might easily be struck from the curriculum in this way. Does anyone remember the Nazi ban on "Jewish physics" in Germany in the 1930s? These efforts to dictate the curriculum must be defeated.

Those of us who are university faculty members have a largely unused opportunity to affect the way in which the general public views science and understands the way in which science actually operates. A large fraction of high-school graduates go to universities and virtually all of them are required to take some science courses. What is the function of these generic Science 101 courses? We like to think that these courses provide a part of a broad education. When I teach such courses, my aim is to answer the question: "What do I want these students to remember twenty years from now?" I do not care whether they remember Ohm's law or Kepler's law or whatever. What is more important is that they understand that science is a rational enterprise, that there are ways in which new ideas get incorporated into the body of accepted scientific fact and theories. I want them to understand what we mean by *theory*. In short, I want them to have some understanding of how science works—as we see it, not as various other people might hope or claim that it is.

It is imperative that we devote some of our class time to discussion of

Michael Friedlander is a professor of physics at Washington University in St. Louis, Missouri. He has studied cosmic rays for many years, and his most recent book is A Thin Cosmic Rain *(Harvard University Press, 2000). He has also long had an interest in the way in which science works and the conflict between science and pseudoscience. His books in this area are* The Conduct of Science *(Prentice-Hall, 1972) and* At the Fringes of Science *(Westview Press, 1995). In 1974, he debated Immanuel Velikovsky at the annual meeting of the Philosophy of Science Association.*

the methods of science and not only the content. Rather than discussing the methods of science in an abstract way, we should draw our illustrations from concrete examples to show how scientists review new ideas. For example, in my introductory astronomy courses, I have enjoyed introducing my students to Velikovsky's foolish and deeply flawed theory of planetary behavior. My questions for the students are, "How do we evaluate such a theory?" and, "What are the criteria by which we judge?" It is my impression that this sort of class discussion is far more likely to be remembered than will most of the solid content that must still provide the framework for the course and that is so easy to evaluate in homework and exams.

What better way to introduce our discussion of scientific method than with Newton's Rules of Reasoning in Philosophy, from volume 2 of the *Principia*:

> Rule I: We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances. To this purpose the philosophers say that Nature does nothing in vain, and more is in vain when less will serve; for Nature is pleased with simplicity, and affects not the pomp of superfluous causes. [What a wonderful comment!]

Rather than discussing the methods of science in an abstract way, we should draw our illustrations from concrete examples to show how scientists review new ideas.

> Rule II: Therefore to the same natural effects, we must, as far as possible assign the same causes. As to respiration in a man and in a beast; the descent of stones in Europe and in America; the light of our culinary fire and of the sun; the reflection of light in the earth, and in the planets.
>
> Rule III: The qualities of bodies, which admit neither intensification nor remission of degrees, and which are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.

We can make a start on educating our students so that they may gain a better understanding of the way in which science actually operates—why scientists may accept some ideas and reject others. I believe this effort is necessary. There will surely be other approaches that reflect our different disciplines and preferences, but underlying our efforts should be the recognition that we need to deal with the ID proponents before they reach the school boards and courts. We must not be only reactive. An informed view of science will not become widespread overnight, but if we do not start now, we will be fighting the same battles repeatedly. □

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The 'New' Idolatry

For a live, prime-time television program, I was asked to evaluate claims that a statue in Sacramento streamed tears of blood. The case prompted me to take a retrospective look at a wide variety of related phenomena, ranging from weeping icons to perambulating statues, many of which I personally investigated over the years.

Catholic bibles

(unlike Protestant ones) contain an extra, fourteenth chapter of Daniel that condemns idolatry with a story.

Idolatry

Belief that an effigy is in some way animated (from *anima*, "breath") not only challenges science's natural-world view, but it also crosses a theological line. It moves from *veneration* (reverence toward an image) to *idolatry* (or image worship) in which the image is regarded as the "tenement or vehicle of the god and fraught with divine influence" (Idolatry 1960).

Religious prohibitions of idolatry are ancient. In the Old Testament, the second commandment is an injunction against "graven images," but only those that were to be adored or served (Exodus 20: 4–5); others were explicitly allowed (Exodus 25:18). Influenced by Islam and Judaism, a movement of iconoclasts (Greek "image-breakers") from about 723–842 sought to carry out the injunction, destroying countless religious works and persecuting those who made and venerated them. In the ninth century, iconoclasm was declared a heresy.

Images proliferated, being widely used for ornamental, instructional, and devotional purposes. In the Orthodox Church image veneration largely focused on icons (wood panels painted in the Byzantine tradition) and was generally more elaborate than the veneration in Roman Catholicism, which tended to favor statues (Images 1993).

A new iconoclasm arose during the Protestant Reformation in sixteenth-century Europe. Reformers like Martin Luther and John Calvin listed image worship among the Church's excesses.

Ironically, Catholic bibles (unlike Protestant ones) contain an extra, fourteenth chapter of Daniel that condemns idolatry with a story. It involves the Babylonian idol of Bel (or Baal) which consumed vast quantities of food and wine—or so it seemed. The apparent miracle won over King Cyrus to worship of the idol. However, Daniel sifted ashes on the floor of the sealed temple and so recorded the footprints of the priests and their families who used "secret doors" to enter and devour the offerings.

As Daniel had reasoned to the king, the idol consisted only of brass-covered clay and "never ate or drank anything." Neither, he might have added by way of extrapolation, do statues move, weep, bleed, or otherwise become animated. Or was Daniel wrong?

Animated Statues

In September 1995, reminiscent of the Idol of Bel, statues of Lord Ganesh and other Indian deities throughout the Hindu world began to sip spoonfuls of milk offered to them. Some observers did notice milk pooling at the bottoms of the statues, but they could not explain how it was getting there.

The secret was discovered by government scientists who offered a statue milk mixed with red dye and noted that, while the liquid disappeared from the spoon, it coated the statue due to surface tension. (This is the same principle that causes two drops of liquid that are

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brought together to form a single drop.) The spoon being naturally tilted a bit, the milk was imperceptibly drawn over the wet (ritually washed) idol. (I was able to study the phenomenon when Indian skeptic Vikas Gora visited my paranormal-investigation lab in May 2001. He had witnessed the original "miracle" and taught me how to make statues and figurines seem to drink.) (Nickell 2001, 312–315)

In contrast to this singular Hindu case, Roman Catholicism yielded several modern instances of allegedly animated statues. In 1981, for example, in a church at Thornton, California, a sculpted Virgin Mary not only altered the angle of her eyes and the tilt of her chin, churchgoers reported, but also wept and even strolled about the church at night. Although no one ever actually witnessed the latter, the statue was frequently found several feet from its usual location, standing at the altar.

A bishop's investigation, however, failed to support the miracle claims. Investigating clerics determined that the purported movement of the statue's eyes and chin were merely due to variations in photographic angles. Worse, they branded the weeping and perambulations a probable hoax. For their efforts, the investigators were denounced by some believers, even being called "a bunch of devils" (Nickell 1998, 67).

In 1985 came reports that a figure of the Virgin in a grotto at Ballinspittle, Ireland, began to sway gently. Thousands of pilgrims, eager to witness the phenomenon flocked to the village to view the statue, which was adorned with a halo of blue lights.

It remained for a group of scientists from University College, Cork, to discover the truth about the statue. They, too, saw the figure sway, yet a motion-picture camera revealed that no such movement had occurred. They soon determined that the effect was an illusion. According to the science magazine *Discover* (Those 1985, 19):

Figure 1. At a Marian apparition site at Conyers, Georgia, the author examines a statue of the Virgin Mary that some pilgrims claim exhibits heartbeats. (Photo by William Evans)

> It is induced when people rock gently back and forth while looking at the statue. At dusk, when the sky is grey and landmarks are obscured, the eye has no point of reference except the halo of blue lights. Therefore, say the scientists, the eye is unable to detect the fact that one's head and body are unconsciously moving. The viewer who sways is likely to get the impression that not he but the statue is moving.

Other phenomena were reported in Pennsylvania in 1989. The case began on Good Friday at the Holy Trinity Church in Ambridge, a quiet Ohio River mill town fifteen miles northwest of Pittsburgh. During the service a luminous, life-sized crucifixion figure of Christ reportedly closed its eyes. At first, no one claimed to have seen the eyelids actually moving, only that the eyes had been about one-third open when the statue was relocated in January, and that during the special three-hour prayer meeting the eyes were observed to be shut. However, the pastor of the church was soon reporting additional claims: "At times the eyes seem to be opening and a little later seem to close again."

Soon, an investigation was launched by the Diocese, with a commission appointed to examine the evidence and report on the astonishing phenomena. After careful study of the before-and-after videotapes, the commission found "no convincing evidence" that the statue closed its eyes during the Good Friday service. When close-up views of the face from each videotape showed the eyes in a similar, partially open position, the commission rejected claims that a miracle had occurred. Commission members stated that they felt the witnesses were sincere but could have been deceived by the church's lighting and by the angles of viewing. In the wake of the commission's report, the pastor was barred from celebrating Mass, and he responded by resigning (Nickell 1998, 65–66).

But if that statue's eyes did not close, what about another's that allegedly opened? They belonged to a "sleeping" figure of Jesus that a Hoboken, New Jersey, street "preacher" had once rescued from a garbage bin. He claimed in July 2005 that while he was cleaning the figurine it opened its right eye. Stories soon spread of the statue "blinking" its right eye, turning its head, and performing other unverifiable feats.

Actually the statue's eyes were never closed. I studied high-resolution photos of the figure and determined that it had

glass eyes and that portions of its upper and lower right eyelids had been broken off, the explanation for the opening-eye effect (Nickell 2005).

Yet other statues—a pair representing Jesus and Mary on a church's bell tower in Campbell, Ohio—had eyes that "glowed." Their halos and Sacred Hearts glowed too, parishioners claimed in 2003. Soon thousands of pilgrims and curiosity seekers had flocked to the site.

I was one of them. However, I soon determined that the statues were not *glowing* at all. Gold leaf on the areas in question was merely *shining*, due to sunlight during the day and other sources (e.g., street and security lights) at night. Using a flashlight, I demonstrated that the gilded areas were merely reflecting light, not transmitting it. Other statues on the grounds—all lacking gold leaf—failed to shine. The local priest and a monsignor of the diocese had reached the same conclusion, but one parishioner told me, "I prefer not to believe that" (Nickell 2003, 6).

Other statue animations have been reported, including chameleonesque effects. For example, the previously mentioned 1989 eye-closing statue at Ambridge, Pennsylvania, also reportedly changed color—from vivid tones on Good Friday to dull ones after. However, these were attributed to the lighting and to pious imagination.

Similar explanations applied to a thirty-inch figure of Mary in a church at Patterson, New Jersey, that reportedly changed color in 1992. One witness saw the base of the statue turn a "dark, dark pink," while another said the figure once "turned the brightest blue." The statue was actually white with pink and blue tones, and the effect appeared to correlate with the emotive force of the believers. Not surprisingly, therefore, many people were unable to witness the color change and went away disappointed (Nickell 1998, 66–67).

Still other statues were supposedly even more remarkably alive: they were said to have heartbeats! The statues were at a Marian apparition site in Conyers, Georgia. Asked by an Atlanta television station to investigate the claims (and others), I found that there were no heartbeats detectable by stethoscope (figure 1). In fact, people were reaching up to feel the throbbings and were instead either feeling the pulse in their own thumbs or once again suffering the effects of pious imagination (Nickell 1996).

In one case in 1980, no one witnessed the initial weeping, and soon, the woman who owned the plaster bas-relief was caught surreptitiously applying "tears" with a water pistol!

Exuding Effigies

Not only statues but icons and other images may seemingly become animated. (Icons are common in Orthodox churches.) According to D. Scott Rogo, in his *Miracles: A Parascientific Inquiry into Wondrous Phenomena* (1982, 161):

> Cases of religious statues, paintings, icons, and other effigies that suddenly begin to bleed or weep have been documented throughout history. Before Rome was sacked in 1527, for instance, a statue of Christ housed in a local monastery wept for several days. When the city of Syracuse in Sicily lay under Spanish siege in 1719, a marble statue of St. Lucy in the city cried continually.

Similar manifestations have been increasingly reported in modern times. Interestingly, Syracuse was the site of another "weeping" statue in 1953. It was reported that the liquid was consistent with real tears, although doubts were raised about the scientific competency and impartiality of the investigators. The woman who owned the original statue had received it as a wedding gift in March, and it began to weep in her presence in late August, the culmination of several weeks of upheaval in her household. She was pregnant, and for several weeks had been suffering "seizures," fainting spells, and attacks of blindness. Local doctors were unable to diagnose her condition, and she may have been seeking attention. The case was followed by an epidemic of similar manifestations across Roman Catholic Italy. Rogo (1982, 178) remarked that they were "no doubt spawned by wide press coverage of the Syracuse miracle."

Two other Italian cases are especially instructive. In one that took place in Pavia in 1980, no one witnessed the initial weeping, and soon, the woman who owned the plaster bas-relief was caught surreptitiously applying "tears" with a water pistol! In 1995 an epidemic of crying effigies followed one that began weeping in Sardinia. However, tests on the blood were clinically analyzed and the DNA was shown to be that of the statue's owner. Her attorney explained, "Well, the Virgin Mary had to get that blood from somewhere" (Nickell 1997a).

Another instructive case transpired in 1985 when a statue of the Virgin began first weeping then bleeding in the home of a Quebec railroad worker. Soon the phenomenon spread to other nearby icons, statues, and crucifixes. Thousands of pilgrims waited in the brutal winter cold to view the "miracle"—as many as 12,000 in a single week. The local bishop went largely ignored as he implied the affair was a false miracle. Then, suddenly, the Associated Press reported that the affair was "all a hoax—not even a very clever

hoax." Newsmen from the Canadian Broadcasting Corporation had been permitted to borrow an icon and had it examined. The blood had been mixed with animal fat so that, when the room warmed from the body heat of pilgrims, the substance would liquefy and flow realistically. The owner confessed he had used his own blood to produce the effects (Nickell 1998, 58).

There are not always such definitive results. An icon I investigated in Astoria, Queens, New York, May 11, 1991, was no longer weeping and my stereomicroscopic examination showed little. However, a videotape of the earlier weeping revealed that the "tear" rivulets flowed from *outside the eyes* and were greatly disproportionate to the diminutive size of the saint's face, observations that suggested a rather crude hoax (Nickell 1998, 54).

Later, the priest who had presided over the Astoria church when it was visited by the weeping phenomenon was presiding over a Toronto church with an icon that had also begun to weep. I was called in on the case twice: first by the *Toronto Sun* newspaper and later by attorneys for the parent church. It turned out that the priest had previously been defrocked and excommunicated for working in a brothel in Athens!

With a fraud-squad detective standing by, I took samples of the oily "tears" for analysis by the Ontario Center of Forensic Sciences. The substance proved to be a nondrying oil, as I had thought it to be on inspection; its use is an effective trick, since one application remains fresh-looking indefinitely. Because no one could prove how the oil got on the icon, the legal case went nowhere, but the church's North American head pronounced it a hoax (Nickell 1997b).

An interesting feature of the exuding icons is the variety of substances involved, together with some apparent trends. In Catholicism the images tended to yield watery tears or blood, until relatively recently when—seeming to tap the Greek Orthodox tradition which has received media attention—there has been an occasional shift to oil. And in the Russian Orthodox tradition, the icons tend to exude myrrh (a fragrant resin) or myrrh-scented oil—as in a case I investigated in Moscow. The "myrrhing" involved an icon of the assassinated Czar Nicholas II and occurred at a time when there was a campaign to bestow sainthood on him and his family (Nickell 2002).

Investigative Approach

As these examples show, more and more frequently we are seeing news reports of "weeping" and other animated effigies. Not one has ever been authenticated by science. However, rather than simply dismiss such claims, I actually investigate them—whenever possible.

It is not unusual for me to be refused access. For example, for a TV documentary about a comatose "miracle" girl, Audrey Santo, near whom icons and figurines dripped oil—producers requested I be permitted to visit the Worcester, Massachusetts, home. The girl's mother at first agreed, but then, on advice from a priest closely associated with the case, she withdrew permission for my visit. I could only comment on the very suspicious circumstances of the case, including the fact that one test of the oil revealed it to be 20 percent chicken fat (Nickell 1999).

One weeping icon was brought to me from Syria by a BBC producer. Suspiciously, it ceased to stream oil as soon as it left its owner, a member of the Chaldean Catholic Church. Alas, nothing, apparently—neither pleas nor insults, not even slicing onions before it—seems able to make it cry again, although I keep it as part of my paranormal collection (Nickell 2004).

Sometimes, I am contacted on short notice, as when CNN asked me to assess the case of the Sacramento statue that appeared to be crying blood. Fortunately, I had been able to see photos and videos of the supposed weeping. I observed that the streams of "blood" came only from Mary's left eye, and that one of the rivulets in fact began above and outside the eye itself. Moreover, the streams were not flowing but rather remained static, as if there had merely been an *application* of the red substance. These observations led me to tell Paula Zahn when I appeared on her show (*Paula Zahn Now*, CNN, December 2, 2005) that I had good news and bad news: The bad news was that the weeping was fake; the good news was that few of the faithful would believe me.

I told the *Sacramento Bee* (Kollars and Fletcher 2005) that the weeping was a "clumsy, obvious hoax." When a church spokesperson, the Rev. James Murphy, said there were no plans to investigate the incident, I responded: "If a statue is a fraud or a hoax, or even just a mistake, it should be determined and that should be that. If it's a fake, then it should be repudiated."

However, the Rev. Murphy expressed an all-too-typical attitude, stating, "If people view this as a miracle and it brings them closer to God, then that's a good thing" (Milbourn 2005). But such an end-justifies-the-means approach is untenable—especially given the seriousness of the matter: an affront to science, religion, ethics, and good sense, as well as truth, all in one.

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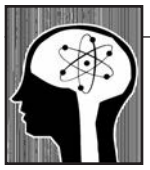

Is Physics Turning into Philosophy?

Physics is, by most people's—especially physicists'—accounts, the queen of the sciences. Philosophy is, according to some physicists (for example, Steven Weinberg, in his *Dreams of a Final Theory*), a useless, perhaps even dangerous, enterprise, because it can slow scientific progress. Yet, two essays published recently in *Nature* argue that physics is in danger of becoming "just" philosophy, or worse, indistinguishable from nonscientific notions such as the anthropic principle, the idea that the universe is fine-tuned to allow for the appearance of life.

George Ellis, reviewing Leonard Susskind's *The Cosmic Landscape* (*Nature* 438: 739–740), says that "heavyweight physicists" are claiming to have proven the existence of parallel universes "even though there is no chance of observing them." Michael Atiyah, commenting on Lawrence Krauss's *Hiding in the Mirror* (*Nature* 438: 1081–1082), observes that there is a danger of a "mathematical takeover" of physics, leading to speculations that, while mathematically elegant, are "far removed, or even alien to, physical reality."

What is going on here? According to Ellis, currently fashionable ideas in physics and cosmology, such as multiverses or string theories, are characteristic of a discipline where "faith in theory tends to trump evidence." Take string theory, for example: it is a mathematically beautiful construct that has the potential of unifying general relativity and quantum mechanics. The problem is that—at the moment—it also is entirely untestable empirically, which makes it an interesting philosophical position but not science.

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Of course, if one begins with the assumption that physics is not only the queen of the sciences but that science is in turn the sovereign of all intellectual disciplines, then it is an insufferable insult for string theory to be "downgraded" to mere philosophy. Then again, this is nothing new. Philosophy has often been the placeholder for areas of intellectual inquiry that have subsequently moved to the domain of science. Physics itself, up until Descartes, was part of natural philosophy. Indeed, Descartes considered himself a scientist, not a philosopher, and it is obvious only in hindsight that he lived at the time of separation between the two modes of inquiry. Psychology was once a branch of philosophy, and philosophy of mind is only now slowly turning into neurobiology and cognitive science. The role of philosophy in each of these cases was to explore the intellectual terrain and clear up the conceptual mud, until ideas and techniques were mature enough to permit a shift to empirically-based inquiry.

Of course, there is no guarantee that *all* areas of logical and philosophical analysis will eventually turn into science, regardless of how much time or technological advance one allows. Despite the fact that biology provides some insights into, for example, both morality and aesthetics, it is hard to imagine turning these two disciplines over to science departments, because they involve human values, not just matters of fact. Similarly, it may very well be the case that we will never find a way to test the idea that there are multiple universes out there. Just because we are curious animals, there is no guarantee that nature behaves in a way that allows us the possibility to get answers to any mystery we are intrigued by.

Another way to look at the conundrum presented by some theories currently being entertained by physicists is that there is a distinction between logical and empirical possibility, and, correspondingly, between logical and empirical truth. The realm of logical/mathematical possibility (mathematics being a branch of logic) is much more vast than that of empirical possibility. For example, it is logically possible for a substance made of two atoms of hydrogen and one of oxygen to behave very differently from water, if the laws of physics were just slightly different than they are. Yet, once the laws of our universe are established, certain facts become empirically impossible. There are other things that are both logically and empirically possible, but have not been realized—for example, the existence of unicorns. At the opposite extreme, if something is logically impossible (for example, for me to be and not be myself), then it is *a fortiori* empirically impossible.

Strings and multiple universes are certainly logical possibilities, since they are features of mathematical theories (assuming that the math doesn't contain mistakes). What we don't know is whether they are also empirically possible and, if so, whether they have in fact been realized. It is the search for an answer to the latter two questions that distinguishes science from logic/mathematics (and philosophy). Yet, neither string theory nor the possibility of multiverses have yet crossed the conceptual line separating logical from empirical possibility. If we pretend that such a line is irrelevant to scientific practice, we risk turning physics into an exercise in faith, not much better than intelligent design "theory" or its close relative, the anthropic principle. □

Circles of Light

A new enigma is spreading on the Internet. Some even call it a new kind of miracle. According to various Web sites, for the past several years unusual and unexplainable circles of light have been observed in many towns and cities. They began in the United States, but soon spread throughout the world.

"These circles," according to a writer named J.D. Rabbit at one of these sites, "most commonly appear on the sides of houses. . . . In most cases they appear when the sun is out, generally when the sunlight is at a suitable angle to reflect from one or more windows onto the house adjacent. Some are seen only in the early morning; others appear at midday or late afternoon for a few hours; others can only be seen in spring and fall; and some have even been observed by bright moonlight. Many have been observed in the same place year after year, while others appear for a while and then vanish."

According to some observers, the circles are a kind of signal coming from UFOs, much "easier" for aliens to produce than crop circles. Others think it is a publicity stunt for some new movie, while some plainly speak of a hoax or of some unknown atmospheric phenomenon.

"At this time of great political, economic, and social crisis," says Benjamin Crème, "Maitreya will inspire humanity to see itself as one family, and create a civilization based on sharing, economic and social justice, and global cooperation." Crème is the leader of Share International, a religious movement that awaits the coming of "Maitreya," a sort of extraterrestrial master who will enlighten the world. According to Crème, circles of light are just "another sign of Maitreya's presence in the world."

"Typically," continues J.D. Rabbit, "they move up or down, changing with the sun's angle as the earth rotates, with some descending at times to appear on the ground. Some shine astonishingly brightly, and as many as six varied circles—some of them double—have been seen at one location. In some places they have been seen on a number of houses in the same block."

For the past several years unusual and unexplainable circles of light have been observed in cities and towns across America and throughout the world.

Without realizing it, Rabbit probably has the solution to this mystery but fails to recognize it: these enigmatic circles of light, in fact, turn out to be . . . simple reflections of sunlight.

"It certainly is a curious reflection of sunlight on some windows," says Stefano Bagnasco, a physicist at the National Institute of Nuclear Physics in Turin, and a member of the Italian skeptic group CICAP. "I was able to directly observe some of these 'signs,' and in each case the building in front of which they appeared was completely covered with windows. Whenever the sun was in the right position to strike this reflecting surface, it would immediately produce the phenomenon. This is something that can certainly appear as quite odd, since these reflections cannot take place when both the windows and the building in front of it are perpendicular to the ground (unless the sun is very low on the horizon). But it happens quite frequently with inclined or open windows, like those found in modern buildings."

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Sometimes the reflections take the shape of an X, depending on the curvature of the window creating the reflection.

"The whole effect is due to gravity and heat," explains Bagnasco. "The glass plate slightly curves in the sun, a couple of millimeters are enough, and it becomes a concave mirror, creating a spherical reflection. However, sometimes it can produce a cross or a double cross, according to how the plates are held by the frames, either with four or six hinges."

A member of CICAP in Turin, Stefano Bardelli, was even able to find just the perfect conditions, demonstrating very clearly how the phenomenon is created (see the accompanying photographs).

The only mystery that remains is why the circles of light cause such marvel. Nobody is surprised at seeing such reflections when walking down the street, because one immediately realizes that they are produced by windows reflecting sunlight. It is only when dozens of pictures of such reflections appear on the World Wide Web, coming from different parts of the world—and newspapers pick up on it—that the "marvel effect" strikes.

It is not unusual for a phenomenon that has a quite simple explanation to become, by word of mouth, an inexplicable mystery. Orbs are another example (Nickell 1996).

"These 'circles of light,'" concludes Bagnasco, "have always been there, but were unheard of in the past; they were noticed and picked up by the media only when somebody looking at them thought they could not have a rational explanation. When something stops being just a simple light reflection and becomes a mystery, people start to see it because it becomes something that strikes the imagination: since crop circles became known, for example, each time a crop field shows some stalks bent by the wind they immediately become an obscure message from the aliens. . . ."

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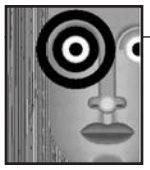
A building showing strange patterns of light.

A building whose windows are being struck by sunlight.

The two buildings, one in front of the other: mystery solved.



SKEPTICAL INQUIREE
BENJAMIN RADFORD

Mysteries of the Coral Castle

Q: I read the following online: "Edward Leedskalnin cut, quarried, and raised a castle consisting of over 1,000 tons of coral rock. His creation, Coral Castle, ranks with the wonders of our world. No one, neither scientist nor engineer, can explain how he accomplished this Herculean project." I am betting that SKEPTICAL INQUIRER can explain how these "fabulous" feats were accomplished.

—D. Dringman

A: We appreciate the vote of confidence, and I'll do my best. Let me preface this column by saying that this is exactly the sort of investigation that is best done first-hand. At times, however, onsite investigation is either impractical, not economically viable, or both. Sometimes analytical investigation can be done almost as effectively from afar. This topic will hopefully serve as a case in point.

Dozens of sources claim that the Castle—reputedly built by a jilted genius between 1920 and 1951—is scientifically inexplicable. An article on the Florida tourist curiosity in *Mysteries* magazine (Diaz 2005) claims that "The question that has perplexed engineers and scientists for decades is how such a tiny, uneducated man single-handedly built such a place." According to the castle's Web site, "Coral Castle has baffled scientists, engineers, and scholars since its opening in 1923."

Eager to read reports of the investigations made by perplexed and baffled scientists, I contacted both the article's author and the Coral Castle information booth. Neither could identify a single scientist or engineer who had specifically examined the castle. This puts the claim in a whole new light, since "hasn't explained" is clearly not the same as "can't explain"—except to mystery mongers and tourism promoters.

Many stories and wild theories have emerged about Leedskalnin and his castle. Some say he levitated the blocks with his mind, or by singing to the stones. Others suggest Leedskalnin had arcane knowledge of magnetism and so-called "earth energies." One author (who prefaced his theory with, "There's no such thing as a stupid idea") suggested that perhaps "there's no such thing as gravity" (Dunn 1997).

There is one detail that virtually all agree on: since the reclusive Leedskalnin worked mostly at night and away from prying eyes, no one actually saw him move the coral. Observant readers may catch the contradiction in the following account: "Although Leedskalnin reportedly [moved] the massive blocks of coral by himself in only a matter of hours, no witnesses can testify exactly how he achieved this." Since no one saw the blocks actually being moved, no one can state for certain that the task was accomplished by Leedskalnin alone. The claim that Leedskalnin didn't use modern (i.e., post-1920s) tools is obviously true, but the mistake is in assuming that modern tools are required to move the heavy blocks of coral.

Ultimately—and ironically—the solution may lie in Leedskalnin's own explanation: that he did it using principles of weight and leverage. "I have discovered the secrets of the pyramids," he said, employing the same methods used by ancient Egyptians. If Leedskalnin was being truthful, then the mystery is solved, for the methods by which the Egyptian pyramids could be constructed are well understood (e.g., Lehner 1997). Photos exist of large tripods, pulleys, and winches at the Coral Castle site, and several sources (e.g., Wallington 1999) demonstrate how massive weights can be moved by one or two people using simple physics. Many mystery mongers arrogantly assume that those living in earlier times (such as Leedskalnin, or the ancient Egyptians, or the Nazca Indians) were not clever or resourceful enough to possibly have created impressive engineering feats without extraterrestrial aid or mysterious powers. This view betrays an ignorance of history and sadly underestimates human ingenuity.

It seems that if scientists haven't explained the Coral Castle specifically, it's because there's little to "explain." The Coral Castle mystery may be simply a matter of poorly informed, magical thinkers who reject a mundane reality in favor of a fanciful myth.

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Ask the Skeptic

Heard about some dubious paranormal or fringe-science claim? Ask the skeptic! Submissions can be sent to: **The Skeptical Inquiree, Skeptical Inquirer, P.O. Box 703, Amherst NY 14226 (or bradford@centerforinquiry.net).**

SETI Requires a Skeptical Reappraisal

Early SETI efforts were marked by overly optimistic estimates of the probable number of extraterrestrial civilizations in our galaxy. In light of new findings and insights, it seems appropriate to put excessive euphoria to rest and to take a more down-to-earth view. Earth may be more special, and intelligence much rarer, in the universe than previously thought.

PETER SCHENKEL

The possible existence of extraterrestrial intelligence (ETI) has always stirred the imagination of man. Greek philosophers speculated about it. Giordano Bruno was burnt on the stake in Rome in 1600, mainly because positing the likelihood of other inhabited worlds in the universe. Kant and Laplace were also convinced of the multiplicity of worlds similar to ours. In the latter part of the nineteenth-century Flammarion charmed vast circles with his books on the plurality of habitable worlds. But all these ideas were mainly philosophical considerations or pure speculations. It was only in the second half of the twentieth-century that the Search for Extraterrestrial Intelligence (SETI) became a scientifically underpinned endeavor. Since the late

1950s distinguished scientists have conducted research, attempting to receive intelligent signals or messages from space via radio-telescopes. Hundreds of amateur astronomers, members of the SETI-League in dozens of countries, are scanning the sky, trying to detect evidence of intelligent life elsewhere in our galaxy. SETI pioneers, such as Frank Drake and Carl Sagan, held the stance that the Milky Way is teeming with a large number of advanced civilizations. However, the many search projects to date have not succeeded, and this daring prediction remains unverified. New scientific insights suggest the need for a more cautious approach and a revision of the overly optimistic considerations.

The standard argument for the existence of a multiplicity of intelligent life runs like this: There are about 200 to 300 billion stars in our galaxy and probably hundreds of millions, maybe even billions of planets in our galaxy. Many of these planets are likely to be located in the so-called "habitable zone" in relation with their star, enjoying—as Earth—favorable conditions for the evolution of life. The physical laws, known to us, apply also to the cosmos, and far-away stellar formations are composed of the same elements as our solar system. Therefore, it is assumed, many should possess water and a stable atmosphere, considered to be basic requisites for the development of life. Such planets must have experienced geological and biological processes similar to those on Earth, leading to the development of primitive life organisms. Then, in the course of time, following a similar course of Darwin's theory of natural selection, these evolved into more complex forms, some eventually developing cognitive capacities and—as in our case—higher intelligence.

In other words, it is maintained, our solar system, Earth, and its evolution are not exceptional cases, but something very common in our Milky Way galaxy. Consequently it must be populated by a huge number of extraterrestrial civilizations, many of them older and more advanced than ours.

Considering the enormous number of stars and planets, these seem like fair and legitimate assumptions. It indeed appears unlikely that intelligence should have evolved only on our planet. If many of these civilizations are scientifically and technologically superior to us, contact with them would give mankind a boost in many ways.

These optimistic views are based mainly on the famous Drake formula $N=Rf_pn_ef_if_jf_cL$. It considers the formation of stars in the galaxy, the fraction of stars with planetary systems, the number of planets ecologically suited for life, the fraction of these planets, on which life and intelligent life evolves, and those reaching a communicative stage and the length of time of technical civilizations. On the basis of this formula it was estimated that a million advanced civilizations probably exist in the galaxy. The nearest one should be at a distance of about 200 to 300 light-years from Earth. German astronomer Sebastian von Hoerner estimated a number between ten thousand and ten million such civilizations.

But because of many new insights and results of research in a number of scientific fields, ranging from paleontology, geology, biology to astronomy, I believe this formula is incomplete and must be revised. The early optimistic estimates are no longer tenable. A more realistic and sober view is required.

I by no means intend to discredit SETI; the search for extraterrestrial intelligent life is a legitimate scientific endeavor. But it seems prudent to demystify this interesting subject, and to reformulate its claims on a new level, free of the romantic flair that adorns it.

Years ago, I readily admit, I myself was quite taken in by the allegations that intelligence is a very common phenomenon in the galaxy. In books, articles, and on radio and television I advocated the idea that our world, beset by problems, could learn a lot from a civilization more advanced than ours. But, in the meantime, I became convinced that a more skeptical attitude would do reality better justice. There are probably only a few such civilizations in the galaxy, if any at all. The following considerations buttress this rather pessimistic appraisal.

SETI pioneers held the stance that the Milky Way is teeming with a large number of advanced civilizations. However, this daring prediction remains unverified.

First of all, since project OZMA I in 1959 by Frank Drake, about a hundred radio-magnetic and other searches were conducted in the U.S. and in other countries, and a considerable part of our sky was scanned thoroughly and repeatedly, but it remained disappointingly silent. In forty-six years not a single artificial intelligent signal or message from outer space was received. Some specialists try to downplay this negative result, arguing that so far only a small part of the entire spectrum has been covered, and that more time and more sophisticated equipment is required for arriving at a definite conclusion.

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Technological and economic criteria may thwart the possibility of extraterrestrial civilizations beaming signals into space over long stretches of time, without knowing where to direct their signals. Or, they may use communication methods unknown to us. Another explanation is that advanced ETI may lack interest in contacting other intelligences, especially those less developed. The argument of the Russian rocket expert Konstantin Tsiolkovski is often quoted: "Absence of evidence is not evidence of absence."

But neither of these arguments, which attempt to explain why we have not received a single intelligent signal from space—is convincing. True, future search projects may strike pay dirt and register the reception of a signal of verified artificial origin. But as long as no such evidence is forthcoming, the possibility of achieving success must be considered remote. If a hundred searches were unsuccessful, it is fair to deduce that estimates of a million or many thousands ETI are unsustainable propositions. As long as no breakthrough occurs, the probability of contact with ETI is near to zero. The argument that advanced extraterrestrials may not be interested in contact with other intelligences is also—as I will show—highly implausible.

Second, as recent research results demonstrate, many more factors and conditions than those considered by the Drake formula need to be taken into account. The geologist Peter D. Ward and the astronomer Donald Brownlee present in their book *Rare Earth* a series of such aspects, which turn the optimistic estimates of ETI upside down.

According to their reasoning, the old assumption that our solar system and Earth are quite common phenomena in the galaxy needs profound revision. On the contrary, the new insights suggest, we are much more special than thought. The evolution of life forms and eventually of intelligent life on Earth was due to a large number of very special conditions and developments, many of a coincidental nature. I'll mention only some that seem particularly important: The age, size, and composition of our sun, the location of Earth and inclination of its axis to it, the existence of water, a stable oxygen-rich atmosphere and temperature over long periods of time—factors considered essential for the evolution of life—and the development of a carbon-based chemistry. Furthermore an active interior and the existence of plate tectonics form the majestic mountain ridges like the Alps, the Himalayas and the Andes, creating different ecological conditions, propitious for the proliferation of a great variety of species. Also the existence of the Moon, Jupiter, and Saturn (as shields for the bombardment of comets and meteorites during the early stages of Earth). Also the repeated climatic changes, long ice ages, and especially the numerous and quite fortuitous catastrophes, causing the extinction of many species, like the one 65 millions years ago, which led to the disappearance of dinosaurs, but opened the way for more diversified and complex life forms.

Though first primitive life forms on Earth, the prokaryotic bacteria, evolved relatively rapidly, only about 500 million years after the cooling off of Earth's crust and the end of the dense bombardment of meteorites and comets, they were the only

lifeforms during the first two billion years of Earth's 4.6-billion-year history. Mammals—including apes and man—developed much later, only after the extinction of the dinosaurs 65 million years ago. The first human-like being, the Proconsul, emerged in the Miocene Period, just about 18 million years ago. The Australopithecus, our antecessor, dates only 5 to 6 million years. In other words, it took almost 4 billion years, or more than 96 percent of the age of Earth, for intelligence to evolve—an awfully long time, even on the cosmic clock.

In this regard we should note also the caveat of the distinguished biologist Ernst Mayr, who underscored the enormous complexity of human DNA and RNA and their functions for the production of proteins, the basic building blocks of life. He estimated that the likelihood that similar biological developments may have occurred elsewhere in the universe was nil.

The upshot of these considerations is the following: Because of the very special geological, biological, and other conditions which propitiated the evolution of life and intelligence on Earth, similar developments in our galaxy are probably very rare. Primitive life forms, Ward and Brownlee conclude, may exist on planets of other stellar systems, but intelligent life, as ours, is probably very rare, if it exists at all.

Third is the so called "Fermi Paradox" another powerful reason suggesting a skeptical evaluation of the multiplicity of intelligence in the galaxy. Italian physicist Enrico Fermi posed the annoying question, "If so many highly developed ETIs are out there, as SETI specialists claim, why haven't they contacted us?" I already expressed great doubt about some of the explanations given to this paradox. Here I need to focus on two more. The first refers to the supposed lack of interest of advanced aliens to establish contact with other intelligent beings. This argument seems to me particularly untrustworthy. I refer to a Norwegian book, which explains why the Vikings undertook dangerous voyages to far-away coasts in precarious vessels. "One reason," it says, "is fame, another curiosity, and a third, gain!" If the Vikings, driven by the desire to discover the unknown, reached America a thousand years ago with a primitive technology, if we—furthermore—a still scientifically and technically young civilization, search for primitive life on other planets of the solar system and their moons, it is incredible that higher developed extraterrestrial intelligences would not be spurred by likewise interests and yearnings. One of the fundamental traits of intelligence is its unquenchable intellectual curiosity and urge to penetrate the unknown. Elder civilizations, our peers in every respect, must be imbued by the same daring and scrutinizing spirit, because if they are not, they could not have achieved their advanced standards.

A second argument often posited is that distances between stars are too great for interstellar travel. But this explanation also stands on shaky ground. Even our scientifically and technically adolescent civilization is exploring space and sending probes—the Voyager crafts—which someday may reach other stellar systems. We are still far from achieving velocities, near the velocity of light, necessary for interstellar travel. But some scientists predict that in 200 or 300 years, maybe even earlier, we are likely to master low "c" velocities, and once we reach them our civilization will send manned exploratory expeditions to the nearest stars. Automatic unmanned craft may be the initial attempts. But I am convinced that nothing will impede the desire of man to see other worlds with his own eyes, to touch their soil and to perform research that unmanned probes would not be able to perform. Evidently, civilizations tens of thousands or millions of years in our advance will have reached near *c* velocities, and they will be able to explore a considerable part of the galaxy. Advanced ETI civilizations would engage in such explorations not only out of scientific curiosity, but in their own interest, for instance for spreading out and finding new habitats for their growing population, or because of the need to abandon their planet due to hazards from their star, and also because with the help of other civilizations it may confront dangers, lurking in the universe, more successfully than alone. The Fermi Paradox should therefore put us on guard, and foster a sound skepticism. Lack of interest in meeting a civilization such as ours is the least plausible reason why we have not heard from ETI.

Carl Sagan held once that intelligent aliens would visit Earth at least once every thousand years. But such visits have not taken place. Even extending this period to a million years, we fare no better.

A little mental experiment illustrates this point. Carl Sagan held once that intelligent aliens would visit Earth at least once every thousand years. But such visits have not taken place. Even extending this period to a million years, we fare no better. Let us assume an extraterrestrial craft landed on Earth any time during the era of the dinosaurs, lasting about 140 million years. It is only logical to assume the aliens would have returned at reasonable intervals to study our world and these fascinating animals, but also to find out if any one of them evolved the capability of reasoning, higher math, and building a civilization. There would have been reason for much surmise. According to paleontologists, Drake stresses, the dinosaur *sauronithoides* was endowed with such a potential. It

was a dinosaur resembling a bird of our size and weight and possessing a mass of brain well above average, and, Drake speculates, if it had survived for an additional ten or twenty million years, it might have evolved into the first intelligent being on Earth. But it didn't happen, because the dinosaurs went extinct due to a cosmic catastrophe. When *Homo australopithecus*, then *Homo faber* and *habilis*, and lastly *Homo sapiens* evolved, shouldn't that have provoked on the part of visiting extraterrestrials a high level of interest? But no such visits are recorded. Only a few mythological, undocumented and highly suspect accounts of alleged visiting aliens exist. It is fair to assume, if advanced aliens had visited Earth during the past 200 million or, at least, during the past 16 million years, they would have left some durable, indestructible and recognizable mark, probably on the moon. But nothing has been detected. The most likely explanation? No such visits took place! There are no advanced extraterrestrial civilizations anywhere in our vicinity. If they existed, they already would have responded to our world's television signals, reaching some 60 light-years into space—another reason invalidating the claim that our galaxy is teeming with intelligence.

Another argument supporting the skeptical point of view sustained here is the fact that none of the detected planets around other stars comes close to having conditions apt for creating and sustaining life. Since Michel Mayor's Swiss group discovered the first planet outside our solar system around the star 51 Pegasi ten years ago, about 130 other planets have been identified within a distance of 200 light-years. Research results show that most are of gaseous composition, some many times the size of Jupiter, some very close to their stars, very hot and with extremely rapid orbital cycles. So far, not one presents conditions favorable for the development of even the most primitive forms of life, not to speak of more complex species. Again it may be argued that only a very tiny fraction of planets were surveyed and future research might strike upon a suitable candidate. This may well be, and I would certainly welcome it. But so far the evidence fails to nourish optimistic expectations. The conditions in our universe are not as favorable for the evolution of life as optimists like to think.

Even if water or fossils of microorganisms should be found underneath the surface of Mars, the importance of such a finding for the theory of a multiplicity of inhabited worlds would be insignificant. Some astronomers think that Titan, the famous moon of Saturn, may have an ocean, possibly of methane. Primitive life forms may exist in it, but this remains to be seen. Even if it does, the evolutionary path from such primitive forms to complex life as human beings is—as we have seen—a long one, studded with a unique sequence of chance and catastrophes.

I am not claiming that we are probably the only intelligent species in our galaxy. Nor do I suggest that SETI activities are a waste of time and money. Though, so far, they have failed to obtain evidence for the existence of ETI, they enrich man's knowledge about the cosmos in many ways. They helped develop sophisticated search techniques, and they contribute decisively to the perception of man's cosmic destiny. Carl Sagan and Frank Drake, the two most distinguished pioneers of SETI, did groundbreaking work. That their efforts and those of other dedicated SETI experts on behalf of this great cause are tinged with a dash of too optimistic expectation is understandable and profoundly human.

However, in the interest of science and sound skepticism, I believe it is time to take the new findings and insights into account, to dampen excessive SETI euphoria and to adopt a more pragmatic and down-to-earth stand, compatible with facts. We should quietly admit that the early estimates—that there may be a million, a hundred thousand, or ten thousand advanced extraterrestrial civilizations in our galaxy—may no longer be tenable. There might not be a hundred, not even ten such civilizations. The optimistic estimates were fraught with too many imponderables and speculative appraisals. What is required is to make contact with a single extraterrestrial intelligence, obtaining irrefutable, thoroughly verified evidence, either via electromagnetic or optical waves or via physical contact, that we are not the only intelligent species in the cosmos. Maybe an alien spacecraft, attracted by our signals, will decide to visit us some day, as I surmised in my novel *Contact: Are We Ready For It?* I would be the first one to react to such a contact event with great delight and satisfaction. The knowledge that we are not alone in the vast realm of the cosmos, and that it will be possible to establish a fruitful dialogue with other, possibly more advanced intelligent beings would mark the biggest event in human history. It would open the door to fantastic perspectives.

But SETI activities so far do not justify this hope. They recommend a more realistic and sober view. Considering the negative search results, the creation of excessive expectations is only grist to the mill of the naysayers—for instance, members of Congress who question the scientific standing of SETI, imputing to it wishful thinking, and denying it financial support. This absolutely negative approach to SETI is certainly wrong, because contrary to the UFO hoax, SETI (as UCLA space scientist Mark Moldwin [2004] stressed in a recent issue of this magazine) is based on solid scientific premises and considerations. But exaggerated estimates fail to conform to realities, as they are seen today, tending to backfire and create disappointment and a turning away from this fascinating scientific endeavor.

The dream of mankind to find brethren in space may yet be fulfilled. If it is not, man should not feel sorry for his uniqueness. Rather that circumstance should boost the gratitude for his existence and his sense of responsibility for making the most of it.

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The Cosmic Haystack Is Large

JILL TARTER

The Cosmic Haystack is large, unimaginably large, and at least nine-dimensional.[1] And that's only the haystack we can describe today with what we know about physics and technology in the twenty-first century, and from our terrestrial and inescapably anthropocentric vantage point. The fact that we've so far pulled a few straws from that haystack, examined them, and declared that no "needle" has yet been found doesn't make the haystack any smaller, nor invalidate the reasons we set out to try to explore it in the first place. If the history of the Search for Extraterrestrial Intelligence (SETI) argues for anything, it argues for better search tools, and fortunately that's what is happening. Skepticism is one of the most important tools in SETI efforts; it is disappointing to see it linked erroneously with human impatience and unfulfilled longing in Peter Schenkel's article.

Pogo said it best (and *Calvin and Hobbs* later echoed)—"Either way, it's a mighty soberin' thought." We search because we want to know the answer to the question, not because we demand cosmic company.

In the mid seventies, Stu Bowyer (an X-ray astronomer with an exceedingly clever idea about how to conduct a piggyback SETI program) gave me a copy of the *Cyclops Report*, a NASA Ames/Stanford/ASEE engineering design study edited by Bernard Oliver and John Billingham. Bowyer wanted to entice me to join his team because I knew how to program an obsolete PDP8/S computer that he'd been given as surplus equipment to use in his search. I read the *Cyclops Report* and drew two conclusions that remain valid to this day. First, I was lucky enough to live in the first generation of humans capable of attempting to do a scientific experiment to answer the question that thousands of previous generations had been able to address only to their priests and philosophers. Second, this was, and is, the most important scientific exploration humanity can undertake. The first conclusion is self-evident, the second one was later poetically phrased by Philip Morrison, who said, "SETI is the archaeology of the future."

The successful detection of a signal from an extraterrestrial technology requires that technologies (theirs and ours) survive for a long time—long, that is, in a cosmic sense, not in human terms. Detection of a signal therefore tells us that we (or at least our technology) *can have* a future. No other human endeavor today is capable of providing us with that information. This doesn't imply "extraterrestrial salvation"; how we get to that future will more than likely be up to us. But it does imply a proof of concept. Detection of a signal requires that we search. That is what I have been doing and will continue to do, and I am hopeful that my successors will do so as well. Quoting Morrison again (writing with Guiseppe Cocconi in *Nature*, vol. 184, p. 844 [1959]), "The probability of success is difficult to estimate, but if we never search, the chance of success is zero."

If the history of the search for extraterrestrial intelligence argues for anything, it argues for better search tools, and fortunately that's what is happening.

Schenkel spends a lot of time on the Drake Equation and suggests that it has some predictive power; it doesn't. The Drake Equation is simply a way to organize our ignorance in order to permit rational discussion. R_* is the only factor in this so-called equation that has any current observational bounds. Within the next decade or so, we may have an idea of the range of values for f_p and n_e. L is unknown and unknowable, in the absence of a successful SETI program. Today, we can say only that approximately 6 percent of stars like the sun host "hot Jupiters" in short-period orbits. While this is vastly more than we could say prior to 1995, when such objects were unknown and unexpected, it says little about the prevalence of terrestrial planets, or other bodies suitable for life. Schenkel has misinterpreted what is now known from the rigorous searches for extrasolar planets, and has confused observational bias (inherent to the current generation of instrumentation and techniques) with results to conclude that habitable planets are rare. So too, he

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Jill Tarter

has confused the interesting and important speculations of the *Rare Earth* volume with results. Given our sample of one, it is difficult to distinguish between the contingent and the truly necessary in the saga of evolution to a technological civilization on planet Earth today. The data are precisely consistent with life (indeed intelligent life) being rare or extremely abundant in the Milky Way Galaxy; as yet we have no data. Which brings us back to the size of the Cosmic Haystack.

Conclusions based on the examination of a small number of stars on our galactic door step, at a few frequencies within the radio and optical portions of the electromagnetic spectrum, during a few minutes of time, with detectors optimized for a limited class of signal types, cannot be very robust. Forty-six years may seem to Schenkel to be a long time to search without positive results. Indeed it's longer than my professional career, during which I've worked very hard to conduct and improve those searches. However, it must be examined in a cosmic context—in light of the ten-billion-year history of our galaxy. For signals to be detectable, they must be co-temporal and that requires that technologies overlap (at least within the 100,000-year crossing time of our galaxy). We ourselves have just emerged as a technological civilization. Should we really be surprised that we haven't achieved instant success? Are we so confident that our current technology is the correct technology for the job? Are we still at the mercy of priests and philosophers, or will we use the power of our exponentiating technology to help us survive into old age, and perhaps along the way discover other long-lived technologies? Pogo was right, but we are a long way from having the data to draw the sobering negative conclusion.

The Allen Telescope Array (www.seti.org/ata) is just beginning an exploration of the astrophysical universe and a search for signals from technological civilizations. As the first telescope to be designed for continuous SETI observations, it will immediately speed up current search strategies by orders of magnitude. Exploitation of Moore's Law will make it faster yet throughout its lifetime. A new OSETI sky survey instrument at Harvard (http://seti.harvard.edu/oseti) is about to be dedicated. All readers of the SKEPTICAL INQUIRER are encouraged to follow the developments of these projects and other ongoing SETI search programs (see www.seti.org/searcharchive) and to contribute suggestions for their improvement or of alternative search strategies. However, if you are lonely and impatient, perhaps you need to consider an on-line dating service.

Success may be difficult to predict, but it's too soon to rule it out.

Note

1. The nine dimensions are: three of space, time, two of polarization (or perhaps photon rotation/twist), frequency, modulation, and sensitivity (a combination of transmitter power and distance).

Astrobiology Is the New Modern Framework Encompassing SETI . . . and So Much Else

DAVID MORRISON

The Search for Extraterrestrial Intelligence (SETI) is a scientific effort that has attracted wide popular interest over the past half century. We all ask "Are we alone?" and SETI programs provide a potential way to answer this question. Intellectually, SETI—and efforts to assess the likelihood of its success—are embedded within a broader framework of astrobiology, which is the study of the living universe. Astrobiology, and its predecessor discipline exobiology, address the origin, evolution, distribution, and future of life in the universe. Primarily, scientists use our knowledge of the history of life on our own planet to investigate the habitability of other worlds and to develop strategies to search for biosignatures of life beyond Earth.

Today astrobiology has developed into an international multidisciplinary field, bringing together biologists, chemists, astronomers, geologists, and planetary scientists to seek common ground. There are two major professional journals in astrobiology, international meetings, several nascent professional societies, a NASA Astrobiology Institute (where I work), and an explosion of college courses and books on this topic. It is within this broader context that we should examine SETI programs and their scientific underpinnings.

Studies of life on our planet continue to broaden our understanding of the robustness of life, and its ability to survive and even thrive in seemingly extreme environments, ranging from boiling hot springs to Arctic sea-ice to the cooling water of nuclear reactors. But while life may be widespread, detecting it on other worlds is challenging. Within our solar system, we may need to return samples to Earth for detailed study that might reveal unambiguous signatures of past or present life. For planets around other stars, astronomical techniques are all we have. The problem here is to understand what global biomarkers (such as oxygen in an atmosphere) can be relied upon, and how we can develop the new instruments to make the required measurements. SETI presents us with an alternative approach to biomarkers. While the occurrence of a technological civilization is probably rare even on living worlds, the detection of a radio or optical signal from such a civilization would provide unambiguous evidence of life.

Peter Schenkel's article "SETI Requires a Skeptical Reappraisal" mostly lacks the modern astrobiology perspective. His target is high expectations of the success of SETI based largely on philosophical positions that go back to Giordano Bruno. In fact, much of his article seems to be aimed at refuting his own past optimistic positions, making his reappraisal a personal statement of reduced expectations. Probably the truth about current ideas on SETI lies between these optimistic and pessimistic extremes.

One area in which I believe Schenkel is too negative is the matter of the prevalence of exoplanets—planets circling other stars. It has been common in evaluations of the Drake equation to set this number at between 10 percent and 100 percent, based until recently on little hard information, since no exoplanetary systems had been discovered. All this has changed in the past decade, with more than 150 exoplanets known today. Initial results were confusing and perhaps disheartening for SETI supporters, since the systems being discovered were dominated by giant planets very close to their suns. These "hot Jupiters" are

While life may be widespread, detecting it on other worlds is challenging.

Planetary scientist David Morrison is a CSICOP Fellow and a recent winner of the Carl Sagan Medal of the American Astronomical Society for his contributions to public understanding of science. He has played a leading role in defining the new discipline of astrobiology and is currently senior scientist at the NASA Astrobiology Institute.

incompatible with the presence of Earth-like planets. But these strange (to us) configurations are actually found in only about 10 percent of solar type stars. Recent improvements in detection technology are now revealing systems with giant planets in jovian-like orbits, which leave open the possibility of terrestrial planets like our own. Today these Earth-like planets are undetectable, but within three years the NASA Kepler observatory should be able to find analogues of Earth. Thus the new results, while inconclusive on the prevalence of Earths, are actually encouraging. Earth-like planets may be common in the universe, and we should soon know!

The "rare Earth" hypothesis is also used by Schenkel as an argument against the common presence of inhabited planets. He correctly lists several unusual features of Earth that seem to have been favorable to the evolution of advanced life. The exact duplication of such a situation in another planetary system is indeed rare. But are these elements of our past history really required? I do not think we know enough about the origin and evolution of life to define the range of conditions that are conducive to life and intelligence. Earth is rare, but it does not necessarily follow that inhabited planets are rare.

His note that it required "more than 96 percent" (I think he meant 99 percent) of the age of Earth for higher intelligence to evolve illustrates an interesting logical error. We always look at the past from our present perspective. I read Schenkel's article only today, which represents less than one trillionth of the age of the Earth, but that really does not say anything about the probability of this article having been written and sent to me by the editor of SI. Besides, there are probably many Earth-like planets with up to twice the age of our solar system.

Is SETI likely to succeed in our lifetimes? I do not know. I hope so, of course, but I cannot assign a probability to such near-term success. I think the situation demands skepticism but not pessimism. I think that Schenkel would agree with this perspective.

There are two well-known SETI-related conclusions of which we can be confident, however. If we succeed, any civilization we detect will almost surely be far in advance of our own, and the message itself may be indecipherable. We should not, therefore, look to SETI for easy solutions to our current challenges on Earth. The second conclusion is that, while we may not succeed if we search, we are assured of failure if we do not search.

The New Approach to SETI Is from the Bottom Up, Rather Than the Top Down

DAVID DARLING

As far as the prevalence of life and intelligence throughout the galaxy goes, the simple fact is we still have no idea. All our estimations and projections continue to be based on a single datum—namely, the life we find around us here on Earth. There are those, such as Peter Ward and Donald Brownlee, who personally see evidence that complex life may be quite rare, even if unicellular life comes about fairly routinely. There are others who see it differently. To give a specific example, routine cosmic catastrophes will, it is claimed, destroy the chances of complex life emerging except in the most unusual cases. Yet, one such catastrophe, at the end of the Cretaceous, was the very reason that high-level intelligence developed on Earth! All of our current hypotheses about the likelihood of extraterrestrial life and intelligence are nothing more than opinions based on inference and one data point. What we must do is continue to look for hard evidence, both locally (within the solar system) and across interstellar distances. Neither optimism nor pessimism is helpful when based on ignorance.

Set against the fact that SETI has not so far received a positive signal are a number of encouraging developments in astronomy and astrobiology. These include the detection, since the mid-1990s, of more than 150 extrasolar planets, and increasing signs from within the solar system that the conditions deemed necessary for the development of life as we know it (water, organics, and a suitable energy source) may arise on multiple worlds around a single star. Astrobiology is in the ascendancy. Mars, Europa, and Titan head a short list of locales in our neighborhood where scientists would not be at all surprised to find extant microbic life. We are detecting increasingly complex molecules in interstellar space and evidence that life might be able to survive trips between worlds aboard meteorites. As I explain in my book *Life Everywhere* (Basic Books, 2001), terrestrial life, from the outset—not just over the past few hundred million years—has shown a propensity to become increasingly complex and display the rudiments of intelligent behavior.

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The rise of astrobiology and of exoplanetary astronomy has offered SETI researchers a new approach which the SETI Institute, in particular, has embraced. That is, it enables the attempt to make contact with other intelligences to be done from the bottom up rather than the top down. Within the next decade, increasingly powerful and sensitive instruments, based on interferometry, will allow us to detect Earthlike worlds that may orbit sunlike stars within a range of a few hundred light-years. These instruments and their successors will enable us then to analyze the light coming from these "alien Earths" to search for biogenic signatures, such as those of molecular oxygen and chlorophyll. If we are successful in demonstrating beyond reasonable doubt that certain known planets are life-bearing, we can then begin to study these worlds more closely to see to what heights their indigenous life has evolved. Are there signs of industrial contaminants in the atmosphere or stray artificially produced EM emissions? When we reach this stage of our investigations, astrobiology and SETI will join forces in an effort to determine if high intelligence is present.

Personally, I feel there's only a slim chance that any time soon we'll make contact with another race in our galaxy that is at roughly the same technological level as ourselves. I suspect there is a technological window of about 500 years beyond which we would effectively be blind to another intelligent species. The galaxy may be swarming with advanced intelligence that is as invisible to us as satellite communications is to a native in the rainforest. Moreover, our galactic elders, if they exist, far from having any desire to communicate with us, would likely be interested in us only as biological or anthropological specimens. They may also have the wisdom to appreciate that any interference by them in our affairs would have the potential to destroy our culture, just as we in the West have harmed the less technologically advanced races on Earth with whom we've made first contact. □

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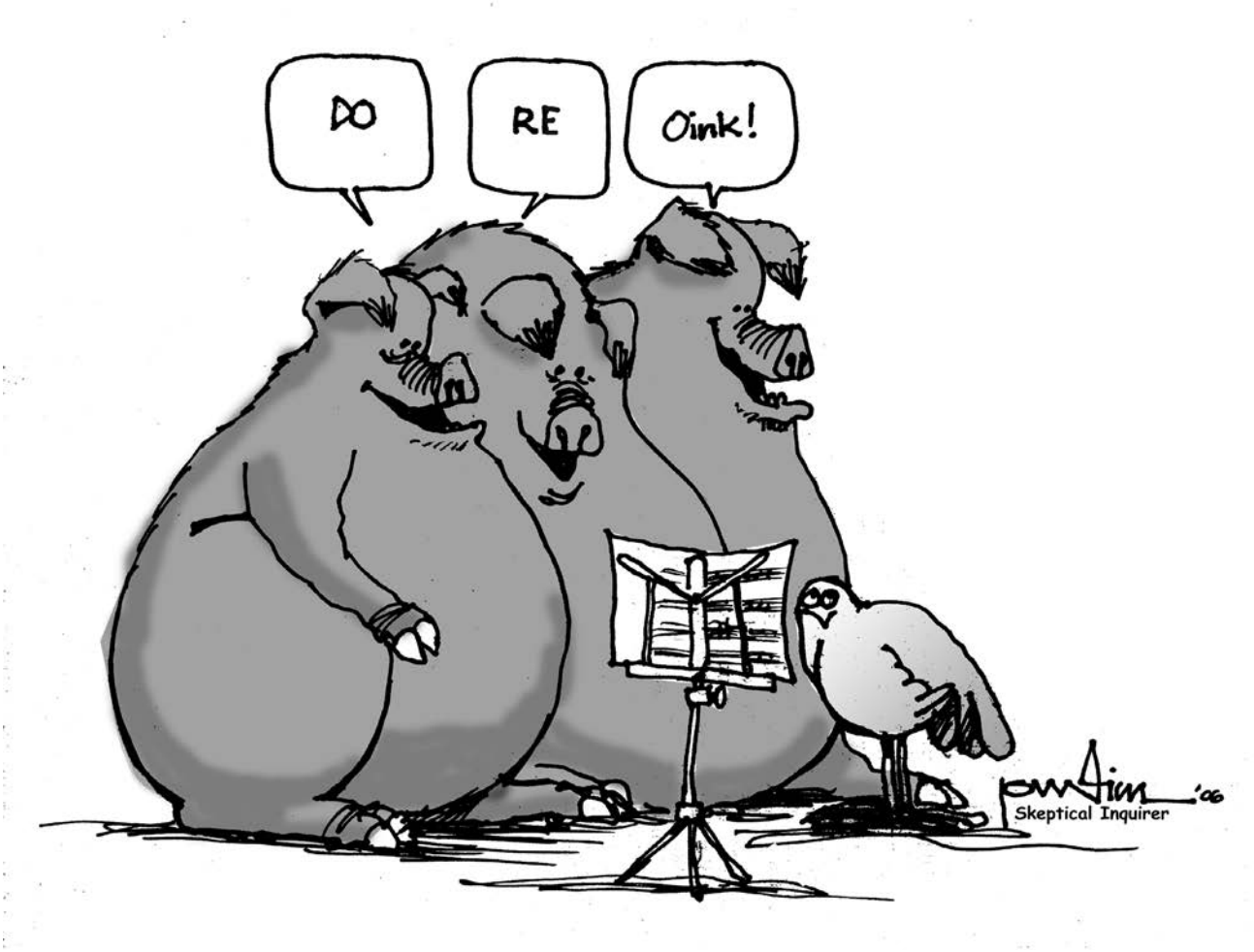
Teaching Pigs to Sing
An Experiment in Bringing Critical Thinking to the Masses

A skeptic encounters psychics, astrologers, and other strange creatures and discovers firsthand how they react to science and reason. Included: a fable about testing the Tooth Fairy.

HARRIET HALL



A couple of years ago, I saw an announcement for an astrology presentation to a local discussion group called Mingling of the Minds. My first reaction was, "Surely, nobody really *believes* in astrology anymore! At least not in my well-educated community." I decided to go "mingle my mind" and find out.

I was appalled. These people had heard some of the arguments against astrology, but they entirely discounted them. Their personal experience was that astrology worked, and that's all they cared about. The speaker had prepared charts for several members of the group, with scientific-looking symbols and calculations, and they seemed very impressed. I tried to introduce a bit of skepticism by asking questions like, "How did the first astrologers learn which human characteristics corresponded to which heavenly signs?" The speaker said that was an interesting question that could never be answered, because we lack any historical records. Of course, he didn't doubt that they had obtained their knowledge by some reliable means.

Sure they had. I heard about a woman who told a group of friends she had identified new constellations for a more up-to-date astrology; instead of names like Sagittarius and Pisces, the new constellations had names like Vacuum Cleaner and Telephone. She explained how those born under the Vacuum Cleaner are perfectionists who like everything to be neat and clean, and how those born under the Telephone sign are verbally oriented, good communicators, and have lots of friends. Her friends didn't get the joke. They asked where they could learn more about this great new system!

In retrospect, I probably should have told the astrologer I wasn't going to believe in astrology because my horoscope said I shouldn't be gullible.

Future "Mingling of the Minds" sessions were planned with psychics and other strange creatures. I decided that these people were in desperate need of a resident skeptic, so I appointed myself. I knew there was no hope of converting any true believers, but I thought there must be at least a few people who had not irrevocably made up their minds and might like to know the facts.

My skeptic friends tried to warn me: "Never try to teach a pig to sing; it wastes your time and annoys the pig." I knew this, but I didn't think it applied here. I'm an optimist—these were nice, friendly, reasonable people, and I thought at least some of them would enjoy learning some of the things I had learned. I used to believe a lot of weird things myself, until evidence and reason persuaded me to change my mind. I find it intellectually satisfying to discard an error and learn a truth. I thought others might get the same satisfaction. My friends laughed at my naïveté; but I am a skeptic, so I had to find out for myself.

It was the beginning of an odyssey that introduced me to a strange race of people who believed in angels but not in germs. I can only compare it to visiting a carnival freak show of intellectual, rather than physical, anomalies. I observed how the average nonskeptic member of the public reacts to these anomalies. It almost destroyed my faith in human reason.

We heard from a *feng shui* practitioner. He explained that *feng shui* is a science, and he went into details like how you should position the head of your bed to the north. I asked him if he meant geographic north or magnetic north. I'm not sure he even knew the difference, but he guessed that it was probably magnetic north because *feng shui* has to do with forces that are sort of like magnetic forces. The magnetic north pole is in northeastern Canada; I asked him what he would tell a client who lived in northeastern Canada, directly north of the magnetic north pole—if the client put the head of his bed towards the magnetic north pole, it would be actually be pointing due south. His only answer was, "Gee, that's an interesting question." I thought so too. It's an interesting science if it only applies to certain parts of the globe.

The *feng shui* guy also sells Chinese medicines. He always checks by opening each bottle and tasting or at least looking to be sure it contains what the label says, because sometimes he finds an entirely different herb in the bottle. That's his idea of quality control. Nevertheless, he is quite confident that these herbal products are safe. One of the safe remedies he showed us was a Chinese pain reliever called Lemonin. I could see from the label that it was an overpriced mixture of paracetamol, caffeine, and vitamin C. He didn't know that paracetamol is the British name for acetaminophen (Tylenol), so of course, he couldn't warn his victims (oops, I mean *clients*) that taking Tylenol along with Lemonin could result in a fatal overdose.

A chiropractor insisted that newborn babies needed immediate chiropractic adjustment, because their necks are stretched to over twice their normal length during childbirth, even by C-section. I told him that I knew that was not true, because I used to deliver babies. It couldn't be true, because that amount of stretch couldn't happen without killing the baby. He assured us that, yes, it really does a lot of damage.

Another chiropractor explained that he doesn't believe in the germ theory, because if germs caused disease, we'd all be dead. The only reason some people get sick is because their spines are out of alignment. He has never been vaccinated, yet he is confident he could be exposed to any infectious disease without catching it. Next time we need volunteers to treat a case of Ebola, let's call on him!

A third chiropractor told us how he diagnoses allergies. He has the patient hold a closed vial containing an allergen in one hand, and he tests the muscle strength in her or his other arm. If it is weaker than before, they are allergic to what's in the vial. He thought one patient might be allergic to his workplace, and he didn't have a vial of "Boeing," so he had the patient just *think* about Boeing, and that worked just as well. He found people were allergic to all kinds of things they had never imagined. He had all kinds of testimonials about miraculous cures. I pointed out that this method, called applied kinesiology, had failed all controlled tests and was rejected even by the

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majority of his own profession. I read him the words of a professor of chiropractic, who essentially said applied kinesiology was about the stupidest quackery any chiropractor had ever fallen for. He was not impressed: *his* method *works*.

I took out a small implement and handed it around the group. No one could guess what it was for. I explained that it was a fleam, a lancet used in bloodletting. The ancient Greeks believed there were four humors, and they balanced

I asked one woman what she would think of me if I still truly believed, at my age, that the Tooth Fairy really exists. She said, "I'd think that was really sweet!"

the humors by bleeding the patient for fevers and other illnesses. George Washington's death was hastened (if not caused) by bloodletting. The treatment was in use for many centuries, until science finally tested it and found out it did more harm than good. I told the chiropractor that I could come up with more testimonials for bloodletting through the centuries than he had for muscle testing. If he rejected the scientific evidence that applied kinesiology didn't work, it would be consistent to reject the scientific evidence that bloodletting didn't work. If he accepted the evidence of testimonials for muscle testing, it would be consistent to accept the evidence of many more testimonials for bloodletting. Would he use a fleam? No, he wouldn't. A lady friend asked, "But what does his method hurt, as long as his patients *feel* better?" I reminded her that bloodletting also made lots of people *feel* better, and I offered to use the fleam on her to see if it made *her* feel better. She declined. I can't imagine why.

A massage therapist specialized in energy medicine. She could feel the energy fields around a patient's body and twiddle them to help patients heal. She knew this was real, because a scientist had actually measured the human aura with some scientific instrument. What kind of instrument? Where were the data published? She didn't have the specifics, but she assured me I could learn about it in a book called *The Isaiah Effect*. I got that book and read every word of it, but couldn't even find the word *aura*, much less anything remotely scientific. It is arguably the worst book I have ever read, with an average of one and a half errors of fact or logic per page—I counted. I told her that I found nothing in the book about measuring auras, and her only answer was, "Oh."

A couple of self-styled "intuitives" (i.e., psychics) spoke to us, and did some amateurish cold readings. One explained away apparent failures by saying that she might be seeing something in the *future*, and that her intuitions could not perceive time; she immediately contradicted herself by saying the next person would have a new job "within the next three years"! She "read" a hypochondriac man and apparently intuited that he wasn't worried enough already, so she told him she could see something terribly wrong in his abdomen that needed urgent care. Another psychic told us she could actually see angels beside each of us. (In psychiatry, this is called a hallucination and is a sign of mental illness.)

Here are just a few of the astounding comments I heard:

> "A molecule made in a plant is natural, so it has to be better than the exact same molecule made in a lab."
>
> "I had to stop taking my homeopathic sleep remedy because it caused side effects." (*Water* causes side effects?)
>
> "I know my headache didn't go away because of any placebo effect, because I would be able to tell if it were just placebo." (So why do you think scientists bother with placebo-controlled double-blind trials?)
>
> "Truth doesn't matter."
>
> "What's true for you may not be true for me; it's okay if we disagree."
>
> "We create our own reality."

I asked one woman what she would think of me if I still truly believed, at my age, that the Tooth Fairy *really exists*. She said, "I'd think that was really sweet!"

The last meeting I went to was a pro-and-con discussion of dowsing. The "pro" side consisted of "I saw it work; there are lots of dowsers." I gave the scientific "con" side, explaining the ideomotor effect and the consistent failure of dowsers to find water beyond the level of chance when tested objectively. My information did not go over well. They wanted to hear more about how it works and less about how it doesn't work. The "pro" presenter explained to me that science just hasn't learned how to test dowsers to get a positive result; it doesn't know the right questions to ask. He also explained that science is based on assumptions, so he doesn't trust science; he trusts his intuitions more, even though he admits his intuition can be wrong.

The Pig Instructor Reconsiders

At this point, I had to recognize that these people did not inhabit my universe. They rejected the scientific method, they didn't care about objective truth, and they were happy in their superstitions. I tried hard to understand them, but I failed. I find science and reality far more exciting than superstition. I agree with Lily Tomlin that "the best mind-altering drug is the truth." Why were the people at "Mingling of the Minds" so reluctant to give up their unfounded beliefs?

Maybe there was something wrong with me. Whenever I told my father I had changed my mind about something, he used to tell me, "If I had a mind like that, I'd change it too." After being exposed to all these "minglers" who refused to change their minds, I began to wonder if *I* was the one who

was abnormal. Maybe I lacked the gene for certainty. Maybe I am unduly prejudiced in favor of reality testing. Maybe they are right: personal experience and belief are all that matters. I was really beginning to get worried.

Then two things happened to reassure me. First, I read the list of obituaries in the *Encyclopedia Britannica* yearbook. Among the famous in all walks of life, the important people, the people who mattered, there were plenty of scientists who had contributed to human knowledge and welfare; there wasn't a single homeopath, astrologer, or psychic on the list. Second, I read *Saturday*, by Ian McEwan. Enough people are reading this novel to put it on the best-seller list, and its main character is a skeptic and critical thinker who says, " . . .[belief in] the supernatural was the recourse of an insufficient imagination, a dereliction of duty, a childish evasion of the difficulty and wonders of the real, of the demanding reenactment of the plausible." Maybe science and reason are slowly winning the war against superstition, even if they are losing some of the smaller skirmishes.

In a sense, the people I met at Mingling of the Minds were the norm and I was the anomaly. Minds are not meant to change easily. Absolute certainty based on authority and eyewitness accounts must have had some evolutionary survival value. Humanity has managed pretty well with instinct, magical thinking, and superstition for a very long time, and it will probably continue to muddle through. The scientific method is a recent innovation; it isn't easy, and it doesn't come naturally.

Time is money, and I finally had to admit that Mingling of the Minds was not a good investment. I cut my losses and resigned. I'm too stubborn to not get the last word in, so I wrote this little fable and sent it to Dan, my opponent in the dowsing debate.

Is the Tooth Fairy Real?: A Fable

Harriet told her little brother Dan that there was no Tooth Fairy; it was their parents who put the money under the pillow.

Dan refused to believe Harriet. He *knew* there was a Tooth Fairy. Every time he put a tooth under his pillow, there was money there the next morning. And all his friends said the Tooth Fairy brought them money too. And it couldn't be Mom and Dad because he'd wake up if they came in the room and lifted his pillow. Anyway, Mom and Dad said there was a Tooth Fairy, and they wouldn't lie.

Harriet asked him how he thought the Tooth Fairy found out about lost teeth, how she got into the house, where she got the money from, and what she did with the teeth. Dan said he didn't know, but wasn't it a wonderful mystery? Harriet pointed out that older kids all eventually stopped believing in the Tooth Fairy. Dan said that only proved that the Tooth Fairy would only bring money to those who still believed in her.

Harriet got several neighborhood kids to help test whether the Tooth Fairy would appear if the parents didn't know a tooth had been lost. It turned out that every time the parents knew about the tooth, there would be money under the pillow the next morning, and every time the parents didn't know about the tooth, there would be no money. Dan said the Tooth Fairy was just refusing to cooperate in those cases, because she wouldn't bring money if she knew she was being tested.

Harriet got out her Junior Detective kit and dusted Dan's Tooth Fairy money for fingerprints. Sure enough, she found their parents' fingerprints on it. Dan said that didn't prove anything, because there are lots of ways the Tooth Fairy could get hold of money the parents had previously touched. Or she could have magically put the evidence there to confuse us. And of course, the Tooth Fairy wouldn't leave any fingerprints of her own because she was magical.

Humanity has managed pretty well with instinct, magical thinking, and superstition for a very long time, and it will probably continue to muddle through.

The next time Dan lost a tooth, Harriet spread flour on the floor, and the next morning, she showed Dan their parents' footprints between the door and the head of his bed. He said that didn't prove anything—his parents had probably just checked on him, and the Tooth Fairy had come later. There were no Tooth Fairy footprints, because fairies don't leave footprints.

The next time Dan lost a tooth, Harriet set up a video camera in Dan's room and caught their parents in the act. (For those readers with dirty minds, I mean the act of removing the tooth and putting money under the pillow.) Dan told her that didn't prove a thing. Maybe the Tooth Fairy wouldn't appear when a camera was present. Maybe she is a shape-shifter who made herself look like their parents on videotape. Maybe she asked Mom and Dad to do the job for her just this once.

Harriet led Dan into their parents' bedroom, opened a dresser drawer, and showed him a box containing all of Harriet's and Dan's baby teeth neatly labeled and dated. She said that was proof their parents were taking the teeth and leaving the money. Dan said it was no such thing; the Tooth Fairy probably passed the teeth on to parents for keepsakes, or maybe she sold teeth to parents to raise the money she put under the pillows. Hey, yeah, that would explain the fingerprints!

Harriet and Dan confronted their parents, who admitted they had been taking the teeth and leaving the money under the pillow. Dan said either they were lying before or they're lying now, and they're probably lying now. Why trust what anyone says? He was just going to ignore everything except what he *knew*: the tooth-under-the-pillow thing *worked*. The Tooth Fairy was *real*.

Harriet screamed in frustration and tore all her hair out. She left it under her pillow. It was still there in the morning. □

The *Real* Sword in the Stone

The Sword in the Stone of St. Galgano, a twelfth-century Tuscan hermit, has been investigated, and the striking coincidences between his life and parts of the Arthurian legends are examined.

LUIGI GARLASCHELLI

Most people are familiar with the legend of the Sword in the Stone, the sword that young Arthur succeeded in pulling out, thus becoming the king of England. The first written form of this legend was told by the author Robert de Boron in a French verse tale called *Merlin* (1200 A.D.)

However, a genuine, ancient metal sword plunged into a rock (figure 1) does exist and is located in Tuscany (Italy). It can be admired in the center of a beautiful, round chapel (figure 2) on top of a small hill, surrounded by the wild woods of this region, near the village of Chiusdino (Siena). At the foot of the hill, the ruins of a roofless Gothic abbey, where the grass has replaced the flagstones of the naves

Figure 1. The sword in the stone in Tuscany, Italy.

(figure 3), add to the mystic fascination of this site.

The sword is attributed to Saint Galgano, a knight turned hermit, who died in 1181. Therefore, the sword would date back to the same period as the legend of the sword in the stone.

St. Galgano

The figure of Galgano Guidotti, who is believed to have been born in Chiusdino in 1148, is shrouded in mystery and legend. Evidence of his historical identity has never been found and no records exist in documents dating back to the time in which he lived.

Galgano was said to have been an arrogant and dissolute young man who became a knight after seeing a vision of the Archangel Michael. Later, during a second dream, Galgano was led by St. Michael across a narrow bridge over dangerous waters, to a wonderful field filled with flowers and thence through a dark underground passage into a round building where he met twelve individuals (the Apostles? the Knights?), was shown a book that he was not able to read, and had a vision of God's majesty.

Shortly afterward, while riding in the woods near his home town, his horse suddenly stopped, and Galgano recognized the place he had visited during his vision.

Figure 2. The Rotonda Chapel on the hill of Montesiepi.

Figure 3. The ruins of the Abbey of St. Galgano.

Here, on a small hill named Montesiepi, he thrust his sword into a rock—where it remains to this day—giving up a life of war and violence for that of a hermit and adoring the upside-down sword which resembled a Christian cross. One year later, in 1181, he died at the age of thirty-three and was canonized four years later.

Galgano's gesture is opposite that of the future King Arthur, signifying peace and humility; however, there are other obvious similarities between the two stories. Galwan was the name of one of the knights of the Round Table, and some features of Galgano's story and second vision can also be found in the later *Perceval* and *Lancelot* poems by Chretien de Troyes.

Galgano's real life was fading away into these legends when, in 1189, the Cistercian monks built a round chapel (the Rotonda) where his hut had been, and shortly afterwards (from 1218) a magnificent Gothic abbey in a clearing near the hill.

The body of St. Galgano is said to have been buried "near his sword," but nowadays nobody knows the precise spot. His remains were unearthed some years after his death, and his skull—still on display in the church of the nearby village of Chiusdino—is the only remaining official relic. Not even a tiny relic from the rest of his body is known of, owing to the

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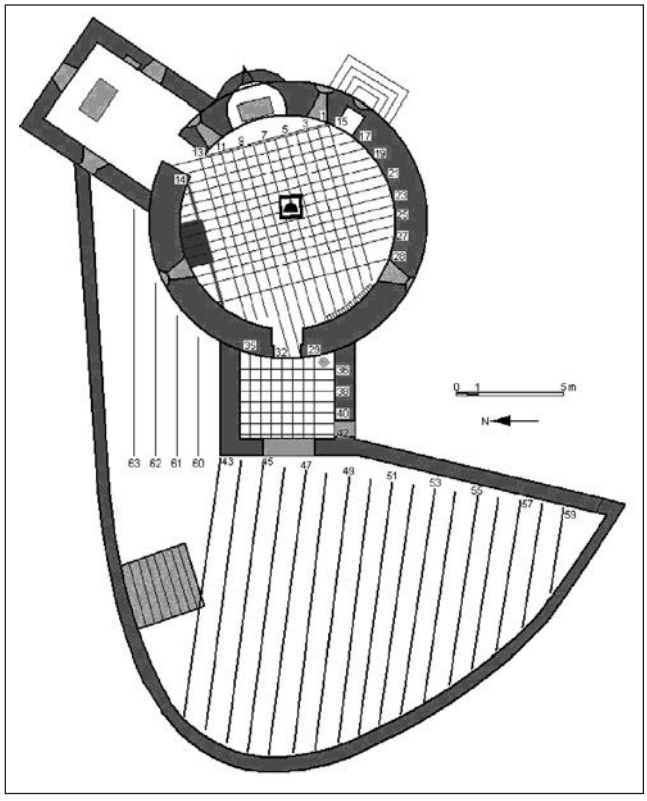

Figure 4. Georadar scan of the floor around the St. Galgano Sword.

fact that he was reburied. All that is left of this fascinating saint, therefore, is his skull, his sword, the round chapel, and a number of stunning coincidences between his legend and those of the Arthurian stories.

In 2001 I had the opportunity to coordinate a number of scientific investigations undertaken to shed light on the riddle of St. Galgano by collecting objective, concrete data from these remains.

Scientific investigations

Radar scanning: The saint's lost grave?

One of our first tasks was to use a special Ground Penetrating Radar (GPR or georadar) to scan beneath the floor inside and around the round chapel. This equipment operates much like a normal radar, as it sends bursts of microwaves under the ground and picks up their reflections to generate an image of hidden objects and structures.

The analysis was performed by pulling the wheel-mounted instrument along a grid of paths about 40–50 cm apart, and storing the data in a computer imaging program.

GPR analysis revealed that beneath the floor around the sword there is just gravel and earth, with one important exception: an artificial structure (2 meters by 1 meter and 1–2 meters deep), possibly a burial recess or a sarcophagus, was identified near the north side of the chapel (figure 4).

Unfortunately, even this is probably not the long sought-after grave of St. Galgano (it must contain a skeleton without a skull, since the head is the only existing relic from the saint's body). Further searches at the State Archive in Florence found records of a excavation that took place in 1694, when a brick-walled burial recess was discovered there, reportedly containing earth and mixed human bones.

Dating of the buildings: A further puzzle

During the following centuries further buildings were added to the original core of the round chapel (1182–1185). Thus, we thought it would be useful to try to confirm the presumed historical dating of the small entrance (ca. 1200 A.D.), the frescoed side chapel (1300), the bell tower (1300?) and the rectory (1700) by means of instrumental data that can be obtained using the thermoluminescence (TL) method.

TL allows us to date certain materials that contain minerals like quartz or feldspar, such as bricks, pottery, and glass by determining when they were fired in the kiln.

As it turned out, TL dating confirmed the presumed historical age: the entrance was probably erected between 1140 ±60 A.D., and the bell tower between 1420±50 A.D.; the material of the frescoed chapel was not suitable for analysis, but from historical documents we know that it was built around 1340.

The Round chapel, the original core, came as quite a surprise. It dated back to 985±50 A.D., therefore about one and a half centuries earlier than expected, although bricks from older buildings may have been used in its construction. However, before 1000 A.D. the use of bricks was not very common in Tuscany, since most buildings were made of stone.

The sword in the stone

The style of the sword is consistent with that of other similar weapons from the same time, and—based upon Ewart Oakeshott's widely accepted classification of medieval swords—we can even label it as an Xa-type sword, typical of the late twelfth century.

Written and pictorial records confirm the actual presence of a sword in that stone since at least 1270 A.D. The sword is represented in a golden case that used to contain Galgano's head; it is also depicted in a fresco on a wall of the Rotonda's side chapel. In 1576 a marble altar covered the sword and the stone, leaving a hole through which they could be seen. In 1832 they were protected by a metal cage or grating, still there in 1924. An eyewitness (born in 1915) has reported to us that in those years the sword could actually be pulled out from the crack into which had been pushed. In that same year molten lead was poured into the slit to jam the blade, and the metal cage was removed.

In the 1960s, an unknown person broke the blade in an attempt to remove the sword from the stone. The broken part was then fixed back into place with concrete, and a second layer was later added to match the color of the rock. On March 21, 1991, the sword was pulled out once again by a vandal (soon captured by the police) and was fixed back.

In 2001, the reconstruction of all these events was extremely difficult. To make matters worse, rumor had it that the sword was a nineteenth century fake, or that it had been switched in the 1920s, and even that there was no blade in the rock.

We decided to inspect the artifact. A vertical hole (approximately 11 mm in diameter) was drilled, running parallel to the presumed position of the blade, in the hope of reaching the cavity or the mass of lead in it. We inspected the hole with a fiber optics endoscope, but saw only plain rock.

Some of the concrete was then removed, and the upper part of the sword was freed and pulled out (figure 5). A second, shorter hole was drilled on a slant and actually came to a metallic object (the rest of the blade). The concrete layer was then further removed, until approximately one inch of the buried blade emerged.

The two pieces (whose edges fit together perfectly, thus confirming that they are part of the same object) are now held in position, for aesthetic reasons, by a small unobtrusive metal clamp.

Small rusty iron fragments coming from the lower part of the blade were collected with a magnet when the concrete was removed and were chemically analyzed for trace metals contained within the iron. These analyses were performed at the University of Pavia, both by Atomic Absorption Spectroscopy and by neutron activation at the Triga Mark II type research reactor at the LENA center, University of Pavia.

Although iron artifacts cannot be unequivocally dated (as in carbon-14 or TL methods), the composition of the metal did not reveal that modern alloys had been used, and so it is fully compatible with a medieval origin. A still different and standard metallographic analysis has yet to be performed, and would consist of examining a small polished area of the object (less than 1 cm^2) with an optical stereomicroscope after chemical etching. The shape, deformation, and composition of the "grains" within the wrought iron would provide further evidence as to how the object was manufactured.

In 1999 a team of Spanish researchers analyzed a sword from the same period that had belonged to El Cid Campeador, the Spanish hero. They determined its geographical origin thanks to the presence of particular trace elements within the iron. Unfortunately, such an analysis could not be performed in our case. However, we compared the "fingerprints" of trace elements within the sword's metal with that of pieces of iron slag that can still be found around the great abbey of St. Galgano. This slag is the waste from the small foundries used by the monks to manufacture their small iron objects, using local iron ore.

If the fingerprints of the slag matched those of the sword, we might ascertain that the sword was made locally. On the other hand, if they did *not* match, nothing could be established since we do not actually know how impurities concentrate in slag or in iron during the foundry process. As often happens, this was the case. The "fingerprints" of the slag matched each other, but did not match those of the sword. Still further analyses come to mind: for example, a radiography (X-ray) of the sword in search of inscriptions which are now invisible but that might have been etched or engraved—as was customary—at the top of the blade near the guard, and that were often the "trademark" of the manufacturer.

Macabre relics

Other objects of an organic nature, such as timber from a dismantled roof, and some pieces of wood (conserved inside a small lead box that had been buried under a floor tile near the sword in 1694) have been carbon-dated by Beta Analitics, Florida. All these remains turned out to date back to the nineteenth century. However, a gruesome pair of mummified arms (figure 6) of unknown origin, traditionally on display in an old glass cabinet near the sword, were also examined. Old chronicles tell that, when St. Galgano was still alive but away from his hut, on his way to Rome to see the Pope, three men tried to pull out the sword, and (so goes the prophetical legend) broke it. When Galgano returned, he miraculously fixed the sword, but meanwhile the villains had been cruelly punished: one was struck by lightning, the second drowned in a river, and the third was attacked by wolves and had his arms torn off. These ghastly remains, believed to be late (and fake) pious relics for the moral edification of worshippers, were also carbon-dated and (surprisingly) turned out to date back to the twelfth century, therefore to the same period in which the saint lived. They were never considered to be Galgano's arms, however. Most probably they were unearthed in 1694, when excavations were performed in search of the saint's grave, and belonged to one of his early followers, a hermit buried in the Rotonda chapel. The mummified arms are now safe inside an iron, bullet-proof windowed relic case.

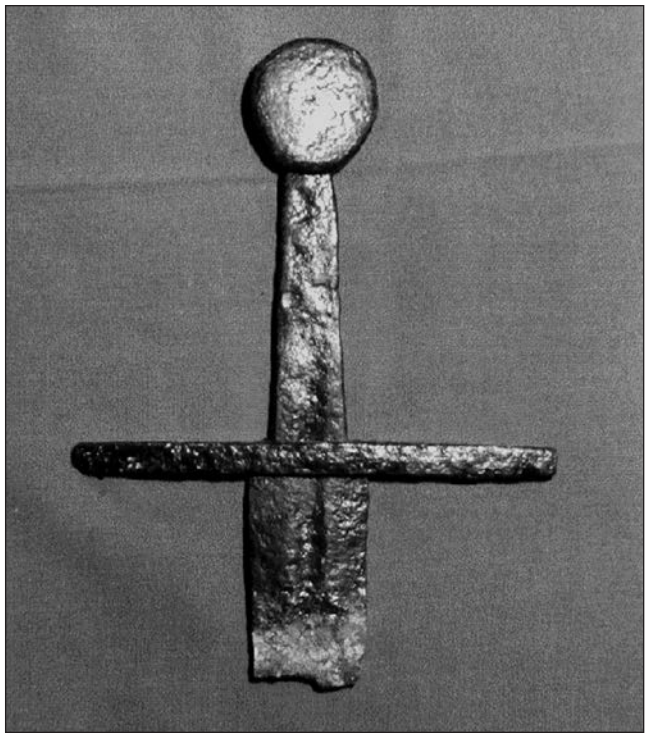

Figure 5. The extracted sword of St. Galgano.

The Knights Templar

The first of the military-religious orders, the Knights were founded in 1118 to protect pilgrims in the Holy Land. Their rule, attributed to St. Bernard of Clairvaux, was approved in 1128 and generous donors granted them numerous properties in Europe.

It is well known that their order, having acquired too much power, was abolished in 1312 by Pope Clement V, after King Philip the Fair of France in 1307 conducted a mass arrest—and

Figure 6. The alleged mummified arms of St. Galgano.

later burned about 120 of them, including Grand Master Jacques de Molay. But during Galgano's lifetime, the order was in full force, and still had a mansion in Frosini, a few kilometers away from Chiusdino. There are traces of Templar symbols in some of the great abbey's stones, and even at the entrance to the Rotonda at Montesiepi there is a painted "patent cross" (a typical shape used by the Knights Templar) near an engraved shell (pilgrims to Jerusalem used to drink from a sea shell, which became their symbol, and that of one of the Knights, too). Was St. Galgano a Knight Templar, before becoming a hermit? There is no evidence to suggest that he was, albeit in at least one chronicle of his life, when he reportedly begs for money to build a chapel on Montesiepi, he is told by his old friends "to go away beyond the sea." As a pilgrim, so as not to bother them any longer, or as a Knight Templar, to earn fame and wealth?

William of Malavalle, the Hermit: The Roots of the Holy Grail's Myth?

In 2002 I took part in an investigation of the bone relics belonging to still another hermit and saint: St William of Malavalle. He died in 1157—at the age of about sixty—when Galgano was still a child, and was made a saint near Grosseto, 80 km from Galgano's chapel.

Legends claim that before committing himself to a life of penitence and becoming a hermit (he also slayed a dragon: see figure 7), he was Duke William X of Aquitaine: the father of Eleanor of Aquitaine, "the queen of the Troubadours." Eleanor was one of the foremost figures in medieval history: spouse to Louis VII of France, then to Henry of England, to whom she gave eight sons and daughters—among them Richard the Lion Hearted. It was in her court, in southern France, and in that of Louis's daughter Marie de Champagne, where artists like Chretien de Troyes who were creating the Arthurian cycle (between 1160 and 1190) were protected and encouraged. A team of paleoanthropologists has now analyzed William of Malavalle's bones to determine his gender, age, health, diet, etc. DNA analysis and even a facial reconstruction have been attempted.

I have analyzed some iron relics conserved alongside his bones in the glass case—including an iron ring mail, a penitence belt, a penitence helmet, etc.—that are clearly made of medieval wrought iron.

Figure 7. William of Malavalle, the dragon slayer hermit; also known as the Duke of Aquitaine?

In short, all these analyses seem to point to a male, who died at the age of about 50 or 60. The long leg bones show the typical marks of a person who used to ride for long periods of his life, and his cranial measurements match those of an average individual from southern France. Of course, these results provide just clues and not evidence; but they do not disagree with what the legends say about the noble origins of William of Malavalle, the hermit.

So, could he be the link between Tuscany's Sword in the Stone and the Arthurian cycle? Although the cycle's first novels appeared in written form as early as 1155, could it have partly originated in the peaceful gesture of Galgano, renouncing violence and war and symbolically thrusting his sword into the ground? Or rather, were the tales of the Arthurian cycle used to embellish the feats of an obscure hermit and boost his cult when the Cistercian monks took over in that area soon after Galgano's death? If this is the case, is the sword itself a very early fake, put there by the monks in the first years of the thirteenth century?

Further evidence may lie underneath the rock and in a careful analysis of the sword and of Galgano's skull; the Arthurian link through William of Malavalle/Aquitaine may be virtually impossible to prove and will remain one of the many mysteries that surround St. Galgano. More multidisciplinary studies are clearly needed to understand what the hill of Montesiepi hides.

But where science meets its limits, and when the language of old stones is silent, we will continue to look with awe on

these fascinating ruins and try to guess the meaning behind all the magic stories.

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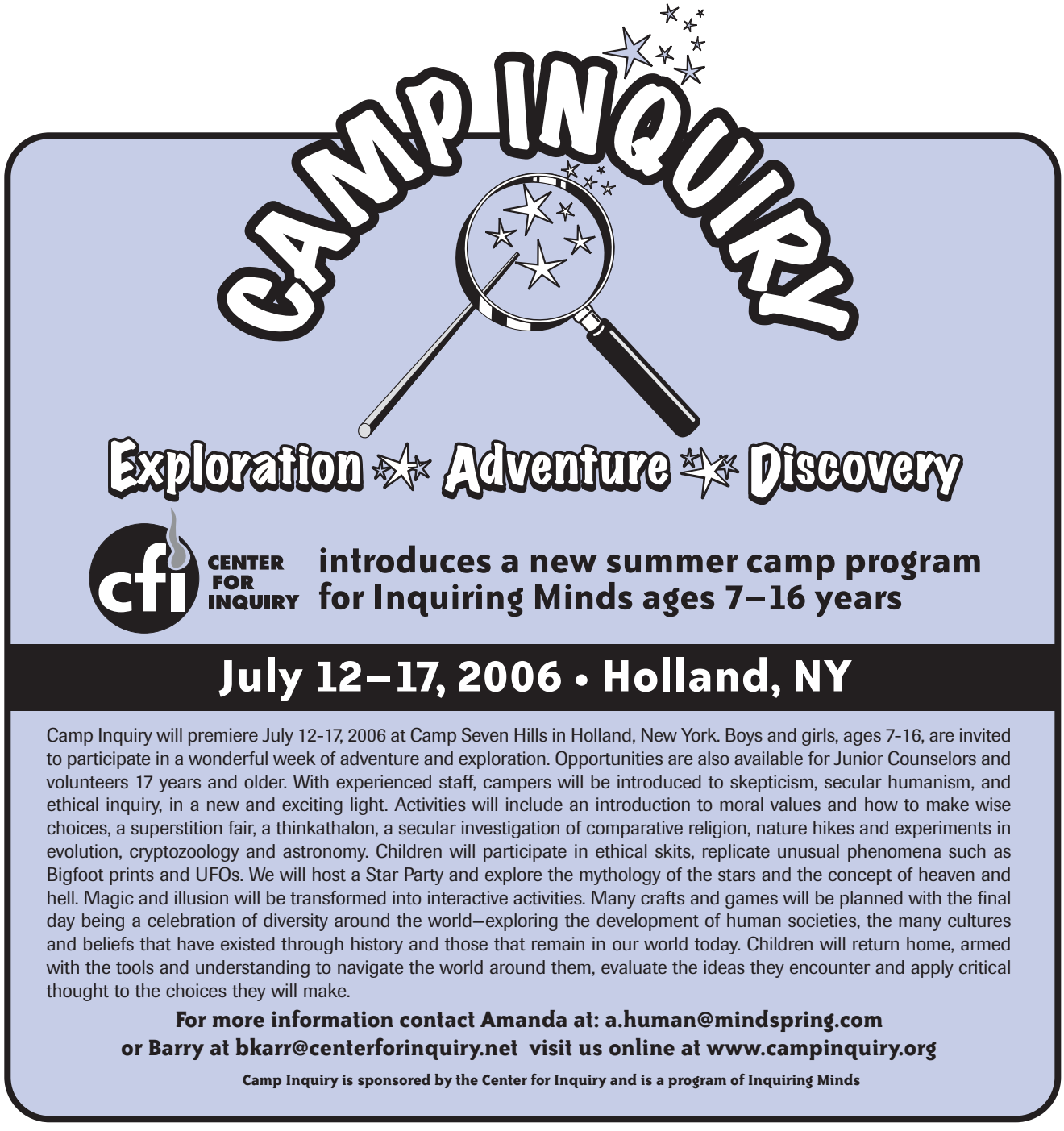
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Why Scientists Shouldn't Be Surprised by the Popularity of Intelligent Design

Perspectives from Psychology

The main obstacle standing in the way of the public's acceptance of evolutionary theory is not a dearth of common sense. Instead, it is the public's erroneous belief that common sense is a reliable guide to evaluating the natural world.

SCOTT O. LILIENFELD

The growing popularity of intelligent design (ID) has left most scientists baffled, even exasperated. From their perspective, the match-up between Darwin's theory of natural selection and ID would be laughable were it not so worrisome. It pits one theory backed by tens of thousands of peer-reviewed articles and consistent with multiple lines of converging genetic, physiological, and paleontological evidence against an armchair conjecture that has flown under the radar of peer review and has yet to generate a single confirmed scientific prediction. If the contest were a boxing match, the referee would surely have stopped the fight seconds after the opening bell.

Yet, to the dismay of most scientists, large swaths of the American public not only harbor serious doubts about Darwinian theory but believe that ID should be taught in science classes. In a 2005 Gallup poll, 34 percent of Americans said they believed that Darwinian theory was false and 31 percent favored ID as an explanation for the development of species. As of this writing, at least forty states are considering initiatives to include ID in public school science curricula. Early this past November, the Kansas Board of education voted to adopt standards mandating teachers to raise questions about Darwinian theory. Echoing the language of ID advocates, these standards refer to unexplained gaps in the fossil record and other purported challenges to the scientific status of this theory. (Shortly after this article was written, U.S. District Judge John Jones ruled that ID could not be taught as an alternative to Darwinian theory in Dover, Pennsylvania, public schools. It is too early to tell whether this ruling will affect popular support for ID across the country.)

In response to such developments, many scientists have expressed disdain—even ridicule—for believers in ID. Nobel Prize winner James D. Watson, co-discoverer of the structure of DNA, was quoted recently in *The New York Times* as saying that only people who "put their common sense on hold" doubt evolutionary theory (Wade 2005). Still other scientists have attributed malevolent intent to ID advocates. Expressing bewilderment at the ascendance of ID among the American public, one of my academic psychology colleagues abroad recently asked me, "What has happened to good sense and decency in the USA?"

Nevertheless, from the standpoint of psychological science, the only thing about ID's popularity that should surprise us is that so many scientists are surprised by it. Of course, much of the resistance to Darwinian theory is theological, and media coverage of ID proponents has accorded nearly exclusive emphasis to the intimate connection between ID and fundamentalist Christianity. Nevertheless, religion doesn't tell the whole story.

ID theorists point out that visiting aliens would see Mount Rushmore as evidence of design.

The other reason for the public's embrace of intelligent design is its compatibility with intuition. *Contra* Watson, it is Darwinian evolution, not ID, that is glaringly inconsistent with common sense. Political commentator Patrick J. Buchanan's (2005) recent statements are illustrative in this regard. Invoking "common sense," "experience," and "reason," Buchanan asked rhetorically, "How can evolution explain the creation of that extraordinary instrument, the human eye?"

Scott O. Lilienfeld is associate professor of psychology at Emory University.

Indeed, from the vantage point of commonplace intuition, it is far more plausible to believe that complex biological structures like the peacock's tail and elephant's trunk were shaped by a teleological force than by purposeless processes of mutation and natural selection operating over millions of years. To many laypeople, the latter explanation seems hopelessly farfetched. ID theorists have capitalized on this "argument from personal incredulity," as biologist Richard Dawkins (1995) terms it, using the sculpted presidential faces on Mount Rushmore as a thought experiment. If an alien visiting the earth were to happen upon these faces, they ask, would it regard them as the outcome of intentional design or of unguided physical processes? The answer is obvious.

The foremost obstacle standing in the way of the public's acceptance of evolutionary theory is not a dearth of common sense. Instead, it is the public's erroneous belief that common sense is a dependable guide to evaluating the natural world. Even some prominent scientists and science writers have missed this crucial point. In a widely discussed article, psychologists Joaquim Krueger of Brown University and David Funder of the University of California-Riverside recently urged their colleagues to accord more credence to common sense notions of human nature (Krueger and Funder 2004). And in a *New York Times* op-ed this past August, science writer John Horgan (2005) called for a heightened emphasis on common sense in the evaluation of scientific theories.

Yet natural science is replete with hundreds of examples demonstrating that common sense is frequently misleading. The world seems flat rather than round. The sun seems to revolve around Earth rather than vice-versa. Objects in motion seem to slow down on their own accord, when in fact they remain in motion unless opposed by a countervailing force.

In my own discipline of psychology, striking violations of our intuitions abound (Lilienfeld 2005). Memory seems to operate like a video camera or tape recorder, but research demonstrates that memory is fallible and reconstructive. Most people believe that shifty eyes are good indicators of lying, but research reveals otherwise. Many people believe that opposites attract in relationships, but research shows that opposites tend to repel. The same goes for scores of other common sense claims regarding human nature, such as the belief that expressing anger is typically better than holding it in, that raising children in similar ways leads to marked similarities in their personalities, that most physically abused children grow up to become abusers themselves, and that the levels of psychiatric hospital admissions, crimes, and suicides increase markedly during full moons.

Of course, none of this demonstrates that common sense is worthless. When it comes to gauging our long-term emotional preferences for people and products, research suggests that we are often better off trusting our gut hunches than engaging in dry, objective analyses of the pros and cons (Gladwell 2005; Myers 2002). Yet when it comes to discerning the workings of the outside world or the three-pound world inside of our cranial cavities, common sense is an exceedingly undependable barometer of the truth.

Ironically, if scientists took the implications of evolutionary theory more seriously, they would understand why. The human brain evolved to increase the probability that the genes of the body it inhabits make their way into subsequent generations. It did not evolve to infer general principles about the operation of the natural world, let alone to understand itself. It also did not evolve to comprehend vast expanses of time, such as the unimaginable tens or hundreds of millions of years over which biological systems evolved. Consequently, it is hardly surprising that many intelligent individuals, like Patrick Buchanan, glance at the remarkably intricate biological world and conclude that it must have been produced by a designer.

To a substantial extent, the fault in the current ID wars lies not with the general public, but with scientists and science educators themselves. Generations of biology, chemistry, and physics instructors have taught their disciplines largely as collections of disembodied findings and facts. Rarely have they emphasized the importance of the scientific method as an essential toolbox of skills designed to prevent us from fooling ourselves. As Alan Cromer (1994) and Lewis Wolpert (1992) have noted, science does not come naturally to any of us, because it often requires us to think in ways that run counter to our common sense (see also McCauley 2000). Mark Twain observed that education requires us to unlearn old habits at least as much as learn new ones. Nowhere is Twain's maxim truer than in effective science education, which asks us to unlearn our reflexive inclination to uncritically trust our perceptions.

Moreover, scientists and the skeptical community at large have been long been waging the battle against pseudoscience on only a single front. They have treated each dubious claim, whether it be ID, astrology, or the latest quack herbal remedy, as an isolated thinking error to be combated. In doing so, they have forgotten that the popularity of ID is merely one example of a far broader problem, namely the American public's embrace of pseudoscience in its myriad incarnations. This one-claim-at-a-time approach helps to explain why scientists are losing not only the ID wars, but also the broader war against public belief in pseudoscience. About a quarter of Americans believe that astrology is scientific and about half believe in extrasensory perception despite the virtually wholesale absence of evidence for either assertion. Public acceptance of alternative medicine continues to mount despite controlled studies showing that most popular alternative remedies are ineffective. Slaying each pseudoscientific dragon as it emerges is laudable and at times necessary, but as a long-term strategy against irrationality it is destined to fail.

Indeed, to win the long-term battle against pseudoscience, scientists must look beyond the narrow battles against ID. The real war they must wage is in the classroom. Specifically, scientists need to effect a sea-change in how science is taught at the junior high, high school, and college levels. They must teach students not merely the core knowledge of their subject matter, but also an understanding of why researchers developed scientific methods in the first place, namely as an essential safeguard against human error.

To do so, they must inculcate in students a profound sense of humility regarding their own perceptions and interpretations of the world. They should teach students about optical illusions, which demonstrate that our perceptions can mislead us.

They should show students how their common sense notions regarding the movements of physical objects, like the trajectory of a ball emerging from a spiral, are often incorrect. They should teach students that even highly confident eyewitness reports are frequently inaccurate. Most broadly, they must counteract what Stanford psychologist Lee Ross calls "naïve realism"—the deeply ingrained notion that what we see invariably reflects the true state of nature (Ross and Ward 1996).

Scientists may well emerge victorious from the current ID battles. Given that the research evidence is overwhelmingly on their side, they certainly deserve to. Yet as Dawkins (1993) reminds us, ideas can mutate at least as readily as genes. Unless scientists institute a fundamental change in how science is taught, it may be only a matter of time before a new and even more virulent variant of Intelligent Design emerges. Then scientists will again be surprised at the public's uncritical embrace of it, while shaking their heads in disbelief at the average American's lack of common sense.

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'Curing' ADHD

A Web search for "Curing ADHD" resulted in 33,000 hits. This is a curious result, considering the unanimous view of scientists that there is currently no cure for Attention Deficit Hyperactivity Disorder.

ALAN D. BOWD

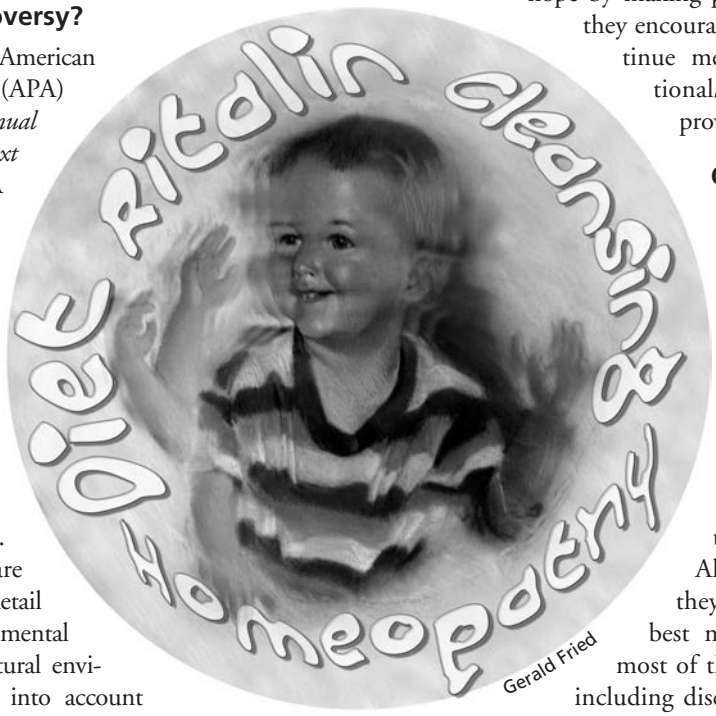
> I have a son who has just turned nine, and his teacher thinks he has ADHD. I don't want him taking drugs every day. Is there some natural way to treat it?
>
> My seventeen-year-old was diagnosed with ADHD in grade six. I was told he would grow out of it by now, but he hasn't. His medication helps but I worry. Is there an alternative?

These are fairly typical of the calls and e-mails we receive at our Centre of Excellence for Children and Adolescents with Special Needs from parents concerned about their children who have Attention Deficit Hyperactivity Disorder (ADHD). We explain that psychostimulant medications such as Ritalin (methylphenidate) are helpful in about 70 percent of cases, that they help control

symptoms, but that there is no cure and the disorder does not end with high-school graduation. We sometimes point out that the traditional classroom is an especially restrictive environment for children with ADHD and that in adulthood they often find employment where their work is not hampered, or may even be enhanced, by their levels of activity. Finally, we add that no link has been established to sugar, food coloring, or diet and that there is no cure for the disorder.

ADHD: Why the Controversy?

ADHD is defined in the American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders—IV, Text Revision (DSM IV-TR)* (APA 2000). It describes the behavior of persons who have a chronic level of inattention, impulsive hyperactivity, or both, to such an extent as to compromise daily functioning. There are three types: Predominantly Inattentive; Predominantly Hyperactive-impulsive; and Combined. The diagnostic criteria are spelled out in considerable detail and emphasize that developmental level, social setting, and cultural environment need to be taken into account when identifying the disorder. Three to seven percent of children have ADHD, and approximately three times more boys than girls are affected. Recent findings clearly indicate that the disorder is a lifelong, neurologically based condition (Weyandt 2001).



However, the diagnosis and treatment—even the existence—of ADHD are subjects of very real controversy. The National Institutes of Health (NIH) found it necessary to release a consensus statement confirming the scientific validity of the diagnosis and treatment of ADHD, including "the literal existence of the disorder" (NIH 2000). Critics have argued that ADHD should not be regarded as a distinct diagnostic entity, because its symptoms are ill-defined, unreliably differentiated from those of other conduct disorders, and not supported by sufficient empirical data (Hallahan and Kauffman 2003). While it is true that the identification of individuals with ADHD includes a substantial element of subjectivity, each objection has been dismissed, not only by the APA but also by the U.S. Surgeon General, the American Medical Association, the American Psychological Association, and the American Academy of Pediatrics (International Consensus Statement on ADHD 2002). Many of the critics have come from educational backgrounds where there is ongoing concern about misidentification and inappropriate prescription of medication for students who may be difficult to manage in school, but who do not have a mental disorder.

The controversy about ADHD receives much attention in the mass media. Hundreds of "cures" and treatments of no demonstrated worth are promoted by individuals with questionable qualifications, as well as by outright hucksters. Most share a financial interest in persuading the public that treatment with psycho-stimulant drugs is ineffective, and even dangerous or life-threatening. Not only do they raise false hope by making promises that cannot be met, they encourage parents to avoid or discontinue medical treatment and educational/behavioral interventions of proven value.

Causes, Cures, Remedies, and Healing—for a Price

Given the abundance of products and services advertised online, I will review here only a small selection, chosen to reflect the diversity of claims for cures and to illustrate the outright misinformation that often accompanies them. Although offering treatments they claim to be superior to the best medical science has to offer, most of these Web sites play it safe by including disclaimers. Ironically, these frequently include the statement that their advice should not to be construed as a substitute for that of physicians or other health care professionals!

Diet

The most widely promoted myth regarding ADHD is that it is caused by a poor diet. Sugar, artificial food coloring, preservatives, additives, refined carbohydrates, and dairy products are most frequently targeted, despite evidence to the contrary, much of it published as early as two decades ago and based on dozens of scientific studies (e.g., Conners 1980; Kavale and Forness 1983; Weyandt 2001; Wolraich, Wilson, and White 1995).

The "ADHD Information Library" Web site advertises Vaxa products (Cowan 2005). It tells parents what their children should *not* eat for the first two weeks of their "ADHD diet eating program for ADD and ADHD kids." These restrictions are: (1) No dairy products (cow's milk is "the single most important restriction"); it is further suggested that because "the brain is

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about 80 percent water," seven to ten glasses a day might be "helpful all by itself"! (2) No yellow foods—but the author points out that bananas are, in point of fact, white—"just don't eat the peel." (3) No junk foods ("if it comes in a cellophane wrapper, don't eat it," presumably referring to both the wrapper and the contents). (4) No fruit juices (too much of the dreaded sugar). (5) Cut sugar intake by 90 percent. (6) Cut chocolate by 90 percent. (These reductions are suggested with no account being taken of the amount originally ingested!) (7) No aspartame. "None. Period." (8) No processed meats and no MSG—"if the meat has chemicals listed that you can't pronounce, don't buy it." (9) Cut fried foods by 90 percent. (10) Avoid food colorings whenever possible. The author concludes with the sage advice: "Just eat foods that God made for a while"! (Cowan 2005).

The controversy about ADHD receives much attention in the mass media. Hundreds of "cures" and treatments of no demonstrated worth are promoted by individuals with questionable qualifications, as well as by outright hucksters.

The Web site includes a disclaimer stating in part that the information on ADHD is presented for educational purposes only and that "products mentioned herein are not intended to diagnose, treat, cure, or prevent any disease." However, the reader is encouraged to purchase a homeopathic remedy priced at $36.95 per bottle, with three varieties suggested for a month's supply. "Millions of people are being placed on activity modifying drugs for their ADHD/ADD but many of these drugs can have dangerous side effects. Attend is a safe, all-natural alternative to these ADHD/ADD drugs. . . . Attend is not just for children and teens. Attend also works great for adult ADD . . ." (GotSupplements.com 2005).

No evidence is offered in support of these claims; the words "safe" and "all-natural" are key in persuading the hopeful.

Cleansing

Curezone.com (2005), whose motto is "Education Instead of Medicating," explains that ADHD (which it describes as a learning disability) is typically the result of one of three factors: a blow to the head; "chemical trauma" manifesting as allergies and food intolerances, often as a consequence of maternal drug ingestion (e.g., birth control pills or antibiotics) before, or during, pregnancy and delivery (if this were true, few mothers would be exempt from placing their babies at risk); and heredity ("better diet can even correct that one")! This Web site recommends "eliminating sugars (fruits, juices, milk products, and refined, simple carbohydrates) from the children's diet," and claims Dr. Atkins found that this "can correct most ADHD." While advocating the adoption of an "Attention Deficit Disorder diet" as the first step in the "Prevention and Curing Protocol," Curezone.com recommends "Body cleansing for kids," noting it is an "extremely important part of every prevention and curing program." This bizarre step in the protocol has three parts: parasite cleanse (recommended without reference to any clinical evidence of infection); dental cleanup (for children older than eight, because of supposedly toxic amalgam fillings); and liver cleanse/flush (to remove stones and impurities). The protocol prescribes physical activity for Attention Deficit Disorder because "it helps cleansing, it brings balance and relieves stress." In fact noncompetitive activities such as in-line skating or skateboarding, in which a child with ADHD experiences success, can help build self-esteem (Weill 1995). Sweating for ADD is described as a powerful way to clear accumulated toxins: "It is known that some modern industrial toxins and pesticides can leave your body only through sweat glands."[1]

Considerable space is devoted to parasites, along with more than sixty pages of graphic photographs, just to show how repulsive these little animals look, and perhaps to create some anxiety in potential clients. Herbs are recommended to eliminate parasites, and a specific brand, Clarkia, comes highly recommended. This is a formulation produced by Hulda Regehr Clark, whose books include *The Cure for HIV and AIDS*, *The Cure for All Advanced Cancers*, and surely her magnum opus, *The Cure for All Diseases*. CureZone.com receives a percentage of all sales of books and products when clients link to the relevant purchase site from the CureZone.com host site. Clark, incidentally, has been the subject of several court cases and now spends most of her time at the Century Nutrition Clinic in Mexico (Clark 2005).

Homeopathy/Naturopathy

While many sites claiming cures for ADHD emphasize diet, nearly all that I visited create and capitalize on a fear of physician-prescribed medications to help peddle their untested remedies. An example follows (the boldface is in the original):

> Rather than **prescribing strong** and sometimes **addictive psychiatric drugs**, (Ritalin, Concerta, Adderall) naturopathic approaches to the treatment of ADHD and ADD take a more holistic look at the individual and take into account diet, lifestyle, personality type, surroundings, and emotional factors.

> Natural remedies are used to **gently and effectively** treat the symptoms, while at the same time helping the person to **heal** and to reach a state of balance and health.
>
> The natural approach is less harmful and more thorough and has a **greater chance** of curing the problem altogether, instead of keeping the individual on psychiatric drugs for many years.
>
> This is very important, **especially** in the case of children, because of the frequent side effects of prescription drugs and the risk of addiction (NativeRemedies.com 2005).

Note the weasel words: *strong*, *addictive*, and *psychiatric* with reference to prescription medication; *gently*, *effectively*, and *heal* applied to the product being promoted. Following that is a pitch for Focus, a product containing six plant extracts, with no evidence for its effectiveness or mention of possible side effects. There is, of course, the usual selection of testimonials that so frequently accompanies advertising for products of this kind. A bottle of Focus will last twenty-five to thirty days at a cost of $26.95 plus shipping. For children as young as three, Focus may be combined with BrightSpark, a homeopathic ADHD "remedy."

It is outrageous that the purveyors of these unproven treatments are taking money from vulnerable parents desperately seeking help for their children. But of equal concern is their deliberate—and often successful—ploy of creating unreasonable fears and anxiety about the use of prescription medications of proven efficacy. According to the American Academy of Pediatrics (2005), methylphenidate (Ritalin, Concerta) and other stimulant medications are both safe and effective. When combined with cognitive-behavioral therapy, "about 80 percent of children with ADHD who are treated with stimulants improve a great deal" (American Academy of Pediatrics 2005). This advice is supported by an extensive scientific literature involving double-blind controlled studies (see Spencer et al. 1996 for a review). It is important that the correct dosage and most appropriate medication be determined individually, a process that usually takes several weeks. Side effects, which are not common, are mild and short-lived, and usually occur early in the treatment. The most prevalent include decreased appetite, weight loss, sleep problems, headaches, jitteriness, social withdrawal, and stomach aches (American Academy of Pediatrics 2005; Greenhill, Halperin, and Abikoff 1999).

The Tip of the Iceberg

CureZone.com was founded in 1997, and by the end of 2001, it had become one of the three most visited "natural-health" Web sites. It claims to openly welcome information, to be not for profit, and thus forced to solicit donations. Thousands of individuals have submitted their stories and articles for publication on the site, and CureZone promotes more than sixty e-mail "support groups" with over 50,000 members (CureZone.com 2005). Yet it is only one among a multitude of similarly dedicated sites clamoring to advocate cures and treatments for ADHD, along with other mental-health conditions and disabilities. Besides the few described in this article, "cures" and "effective treatment" of ADHD are to be found at Web sites representing behavioral optometry (vision therapy), acupressure and acupuncture, chiropractic, megavitamins and mineral supplements, EEG biofeedback, and applied kinesiology—and this is only a partial listing.

The proclamation, "At Cure Zone, we do not recognize word '*incurable*'," (*sic*) (CureZone.com 2005b) is insidiously tempting, especially for vulnerable parents. It is, unfortunately, less dramatic to honestly and openly state, as does the Web site of the American Academy of Pediatrics: "You may have heard media reports or seen advertisement for 'miracle cures' for ADHD. . . . At this time, there is no scientifically proven cure for this condition."

Unfortunately, as readers of this magazine must be well aware, reason speaks with a measured voice; flim-flam's is shrill and, for many, enticing.

Note

1. I could find no evidence for this statement. It may stem from an "urban myth" apparently begun by an anonymous e-mail in 1999. This claimed that using antiperspirants can cause cancer by preventing the sweat glands from excreting toxins. Mervyn Elgart, a professor emeritus of dermatology at George Washington University, has referred to the claim as "a bunch of crap" (Urbanlegends 2005).

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The PEAR Proposition: Fact or Fallacy?

For twenty-five years a group of researchers at Princeton University has been making claims that humans can affect electronic and mechanical devices with their minds. They claim their experiments are conducted in a rigorous, scientific manner and yield above-chance results. However, a close examination of their primary random event generator calls the data into question.

STANLEY JEFFERS

"THIS TIME WE'RE TRYING VULCAN MIND MELD."

For twenty-five years a remarkable group at Princeton University, the Princeton Engineering Anomalies Research (PEAR) group, has been pursuing a research program in what many would characterize as parapsychology. A recent article by this group, "The PEAR Proposition" (Jahn and Dunne 2005) summarizes this quarter-century effort. The bulk of the research has been to show that human intent can remotely affect mechanical and electronic devices in a manner consistent with their intention. They have also reported experiments in remote perception. However, in this article I will take a critical look only at the first group of experiments. I first came upon the work of PEAR while on sabbatical leave in 1992. While browsing in the library, I came upon an article in the journal of the Institute of Electrical and Electronics Engineers (IEEE) with the eye-catching title "The Persistent Paradox of Psychic Phenomena: An Engineering Perspective" by R. Jahn (1982). A number of things struck me about this article: it appeared in a reputable, peer-reviewed, credible scientific journal; its author was clearly a colleague with credible scientific credentials, being formerly a Dean of Engineering; and the work was conducted at an institution with impeccable standards, particularly in the sciences. Jahn's article reviewed historical claims for parapsychology and justifiably rejected many of them for a host of obvious reasons, among them poor methodology, poor statistics, outright fraud, and so on. The last section discussed experiments conducted at Princeton whereby an electronic device was designed to produce a random series of pulses. These were counted in a pre-set time interval and it was established that the accumulated counts scattered around a mean and standard deviation, which conforms to a high degree to Gaussian statistics, i.e., the statistics of random numbers.

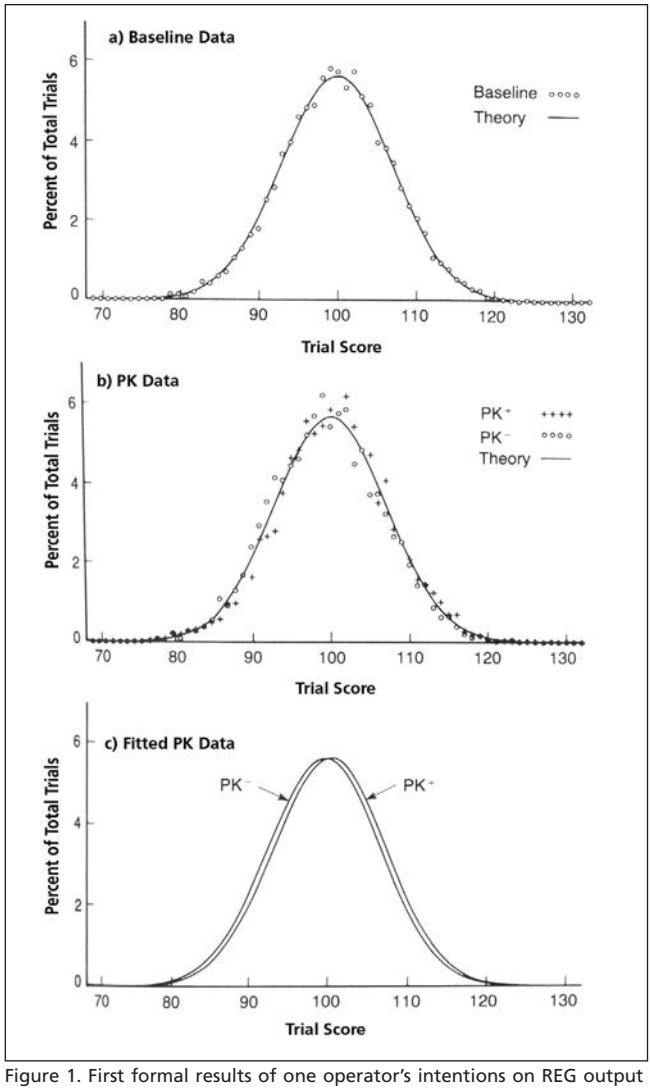

Figure 1. First formal results of one operator's intentions on REG output count distributions, superimposed on theoretical chance expectation: a) baseline data; b) high- and low-intention data; c) best binomial fits to high and low data.

Some of the first results obtained using this device are shown in figure 1. The distribution of the numbers does seem to conform to the expected random distribution about a mean of 100 and with a standard deviation of around seven. A fit derived from the Gaussian distribution with these parameters is shown as the solid line and labeled *theory*. The word *theory* is used in the sense of modeled behavior—here the assumption being that in the absence of any extraneous effects the device behaves in a random manner. *Theory* is not used in the sense of being derivative of a set of physical principles. In their many publications the PEAR group use *theory* to imply fitting of experimental data to statistical expectations.

The data, as published, appear to show a small offset between the data derived when someone is ostensibly attempting to bias the mean to be higher than it would be in their absence (or, more precisely, in the absence of their mental efforts to produce a bias) and conversely a small offset in the opposite sense when someone attempts to bias the output to be smaller than it would be otherwise.

In attempting to underpin the claims for statistical significance with a theoretical basis, the PEAR group make frequent appeals to quantum mechanics and quote approvingly of Schrödinger, Wigner, etc. They argue, in a metaphorical sense, that the parameters of quantum systems can be mirrored by psychological correlates. Some of the claims advanced by the PEAR group are post-dictions, for example, the claims for gender bias, baseline bind, etc. None of these are actually predicted by any of the many interpretations of quantum mechanics.

Methodological Issues

I have conducted several experiments in collaboration with others in this field (Jeffers 2003). One characteristic of the methodology employed in experiments in which I have been involved is that for *every* experiment conducted in which a human has consciously tried to bias the outcome, another experiment has been conducted immediately following the first when the human participant is instructed to ignore the apparatus. Our criterion for significance is thus derived by comparing the two sets of experiments. This is not the

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methodology of the PEAR group, which chooses to only occasionally run a calibration test of the degree of randomness of their apparatus. We contend, although Dobyns (2000) has disputed our claim, that our methodology is scientifically more sound.

If the claims are credible, it should be possible for other groups to replicate them. To their credit, the PEAR group did enlist two other groups, both based at German universities (Jahn et al. 2000) to engage in a triple effort at replication. These attempts failed to reproduce the claimed effects. Even the PEAR group was unable to reproduce a credible effect.

Baseline Bind or Baseline Bias?

One favored way of analyzing and displaying data from experiments of this type is to calculate the accumulated deviation from normal expectations. If humans had successfully biased the data such that it now has a higher mean than in the absence of their efforts, then by forming successive differences in the data so biased with a data set in which there is presumably no bias, then one would get an ever-increasing sum. Similarly, if the subject had succeeded in biasing the data such that the data now had a *lower* mean, the accumulated sum would increment in the negative direction. No bias would result in a cumulative sum, which would hover around zero. Gaussian statistics allows one to assign a likely probability to the cumulative sum if no bias were present. Typically, if this probability, *p* value, is less than .05, then one concludes that a real bias is present. Inspection of the data in figure 2 appears to bear out the claims made. Curves labeled P+ (corresponding to efforts to bias the data to a higher mean value) do indeed accumulate to a running sum unlikely by chance at a $p<.01$, and curves labeled P- (corresponding to efforts to bias the data such that it has a lower mean) do accumulate in the negative sense with a $p<.01$. The baseline plot, BL, obtained

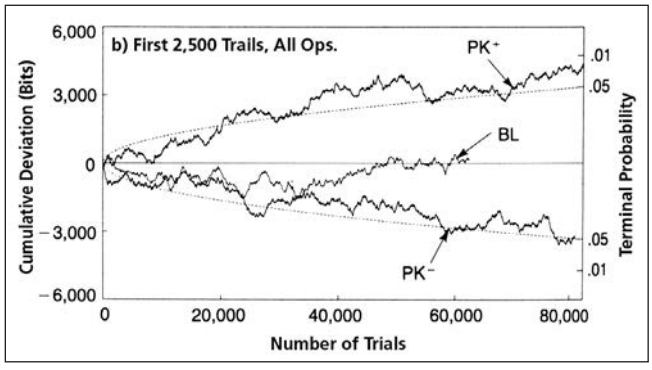

Figure 2. REG Grand cumulative deviations: All operators.

from data in which no effort is made to bias the equipment does indeed, as per expectations, hover around zero.

In Jahn and Dunne's book *Margins of Reality*, a short chapter is devoted to "Baseline Bind." It is reported that "namely, of the seventy-six baseline series performed, seven or eight of the means would be expected to exceed the 0.05 terminal probability criterion, in one direction or the other, simply by chance. In fact not one of them does." In other words, the baseline data are too good. The means of the baseline data conform to the means of the calibration data, but the variance of the baseline data is less than that of the calibration data. This baseline bind effect is attributed to "the conscious or unconscious motivation on the part of the operators to achieve a 'good baseline.'" It is instructive to compare the baseline behavior of the data shown in figure 3 with that in figure 4. The data presented in figure 4 show an accumulated deviation which *actually achieves significance* according to PEAR criteria,

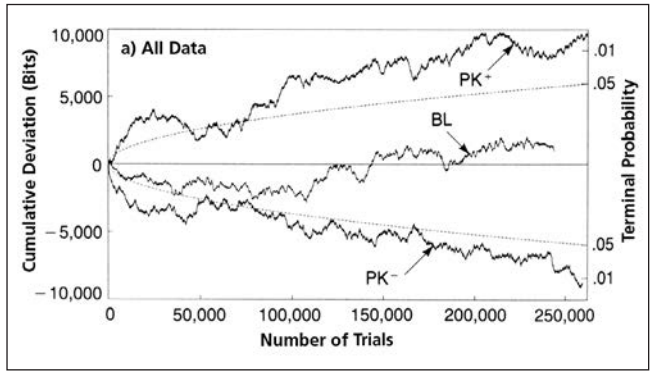

Figure 3. Cumulative deviations of all mean shifts achieved by the same operator as figure 2 over entire database of 125,000 trials per intention.

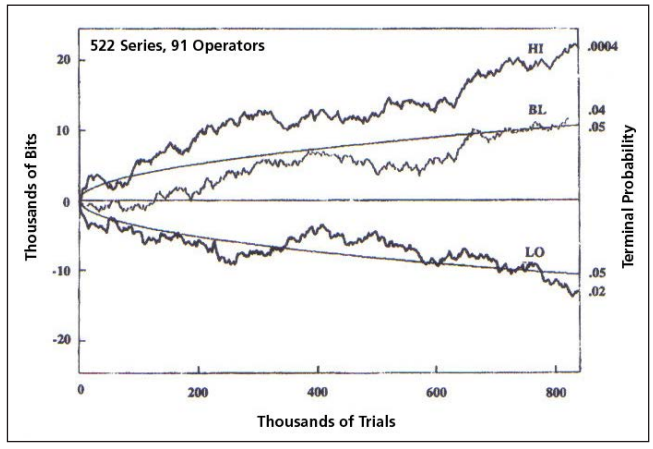

Figure 4. Cumulative deviations of all mean-shift results achieved by all 91 operators comprising a database of some 2.5 million trials.

as the terminal probability lies just outside the $p=.05$ envelope. The data in figure 4 represent all the data accumulated in PEAR's experiments.

When the data shown in figure 4 were first published, surprisingly there was no discussion about the behavior of the baseline data given the previous claims regarding "baseline bind." The baseline data in figure 4 violate PEAR's own criteria for significance (i.e., $p<.05$ terminal probability), and consequently—according to PEAR's own standards—must be regarded as evidence for nonrandom behavior in the baseline data. This has to call into question the claimed statistical significance of the data labeled HI and LO in the same plot.

Conclusions

In their book *Margins of Reality* Jahn and Dunne raise this question: "Is modern science, in the name of rigor and objectivity, arbitrarily excluding essential factors from its purview?"

Although the question is couched in general terms, the intent is to raise the issue as to whether the claims of the parapsychological community are dismissed out of hand by mainstream science unjustifiably. This paper argues that in the light of the difficulties in replication (even by the PEAR group itself), the lack of anything approaching a theoretical basis for the claims made, and, perhaps most damaging, the published behavior of the baseline data of the PEAR group *which by their own criteria* indicate nonrandom behavior of the device that they claim is random, then the answer to the question raised has to be no. There are reasonable and rational grounds for questioning these claims. Despite the best efforts of the PEAR group over a twenty-five-year period, their impact on mainstream science has been negligible. The PEAR group might argue that this is due to the biased and blinkered mentality of mainstream scientists. I would argue that it is due to the lack of compelling evidence.

Acknowledgements

I thank all members of the PEAR team for all their encouragement and support, and Professor J. Alcock of York University for supportive interest and critical insights. Thanks also go to Professor Morris Freeman of the University of Toronto for his interest in the subject matter.

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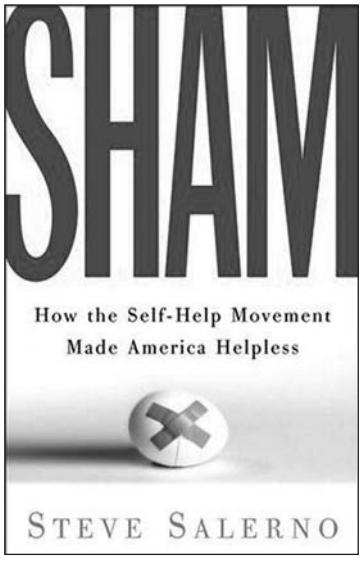
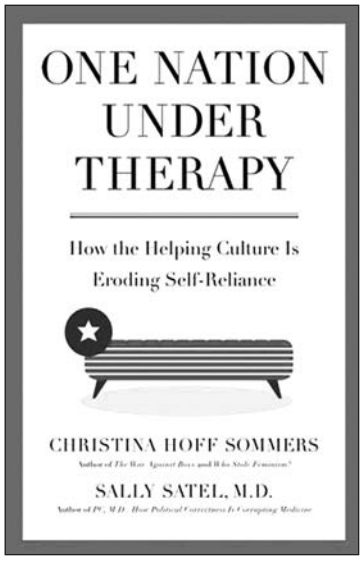
The Ill Effects of the Self-help Movement

TERENCE HINES

SHAM: How the Self-Help Movement Made America Helpless. By Steve Salerno. Crown Publishers, New York, 2005. ISBN 1-4000-5409-5. 273 pp. Hardcover, $24.95.

One Nation Under Therapy: How the Helping Culture Is Eroding Self-Reliance. By Christina Hoff Sommers and Sally Satel. St. Martin's Press, New York, 2005. ISBN 0-312-30443-9. 310 pp. Hardcover, $23.95.





Both books reviewed here are highly critical of the perpetually popular self-help movement, with its vacuous psychotherapies for even minor misfortune and its attempt to eliminate blame for bad behavior by shifting responsibility for one's actions from the individual to some vague "disease." In spite of the overall similarity of their themes, the two books are quite different in their approaches. Salerno, a freelance reporter, writes with a reporter's hard-hitting style. Sommers and Satel write in a more scholarly style, complete with eighty pages of notes at the end.

The acronym SHAM in the title of Salerno's book stands for "Self Help and Actualization Movement." It is most appropriate as he convincingly argues that the whole movement is, just that, a sham. The introductory chapter is an excellent summary of the nonsense in SHAM. I have assigned this introduction to students in my beginning psychology classes, with very good results. They seem genuinely surprised and enlightened, judging from their essays, to learn how dubious SHAM really is. In the introduction Salerno makes the point that "Failure and stagnation are central to all of SHAM. The self-help guru has a compelling interest in *not* [emphasis in original] helping people. Put bluntly, he has a potent incentive to play his most loyal customers for suckers" (p. 7). SHAM has great appeal to repeat customers who become addicted and end up spending years and thousands of dollars bouncing from one SHAM fad or guru to another. This same point is also brilliantly made in episode 9 of the first season of Penn and Teller's *Bullshit*, which shows several rather pathetic examples of self-help addicts.

After the introduction the book is divided into two sections. The first, "The Culprits," contains a brief history of SHAM and chapters devoted to specific SHAM artists, claims, and cons. Tony Robbins, of fire walking fame, and Dr. Phil McGraw both rate chapters devoted to their antics and shady past histories. These chapters contain some very interesting revelations about some of the major SHAM promoters.

The second section, "The Consequences," details the effects of the heavy reliance on SHAM by many Americans. By defining many types of irresponsible behavior as being due to some "disease," SHAM has gone far toward eliminating the idea of personal responsibility for unacceptable behavior. Behavior such as drug addiction used to be cause for moral condemnation and stigmatization. Salerno rejects the idea that drug addition is a disease. But this is a false dichotomy. Simply

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because a behavior has a biological cause, and it is clear that there are biological causes (genetic predispositions and the like) for drug addiction, does not absolve an individual of responsibility for his or her actions. It does not seem at all inconsistent to me to both acknowledge a genetic/biological component to conditions like drug addiction but to still condemn and punish individuals who transgress while under the influence of drugs. Of course, it will also be important to provide treatment for addictions as knowledge of their biological bases improves.

But the best such treatment is probably not that offered by SHAM twelve-step groups like Alcoholics Anonymous and its many off-shoots. Salerno notes that the literature on the effectiveness of treatment shows that there is precious little evidence that programs like AA have any therapeutic effects at all. He also notes AA's historic hostility to any attempt to evaluate whether or not their programs actually work, a hostility shared by numerous other SHAM and alternative medicine pseudosciences.

In the penultimate chapter Salerno argues that SHAM and the I'm-not-responsible ethic has gone mainstream, from "personal to political" (p. 224) as evidenced by the growing "civil rights movement" for alcoholics, addicts, and the extension of the American With Disabilities Act to absurd lengths. For example, in the aftermath of the *Exxon Valdez* disaster, caused by a drunk captain, Exxon issued rules that prevented employees with drug abuse problems from serving as ship captains. That seems reasonable to me—I certainly wouldn't want anyone with a history of drug or alcohol abuse in control of an oil tanker. But, sure enough, Exxon got sued by workers claiming that not allowing drunks and druggies to be captains violated the rights of the aforesaid drunks and druggies.

Another well-known harmful effect of SHAM is the huge emphasis on self-esteem, especially in schools, to the extent that making students feel good about themselves (no matter how ignorant they may be) is seen as more important than actually teaching them anything. The idea is that if you feel good about yourself, you'll do better academically. This is simply wrong, as a review by Baumeister et al. (*Psychological Science in the Public Interest*, 2003, *4* [1], 1–44) clearly shows. Nonetheless, the emphasis on self-esteem has resulted in such absurdities as banning competitive games and giving awards for everyone in a class, no matter how poorly they performed.

The one shortcoming of Salerno's book is that he frequently discusses studies and findings, but almost never gives references. And, in the case of the suit over the *Exxon Valdez* rules noted above, he doesn't reveal the outcome of this case.

The Sommers and Satel (hereafter S&S) book is a more scholarly and nuanced treatment of many of the issues raised by Salerno. The arguments put forth are more sophisticated and backed up by relevant research that is properly referenced. This does not result in a dull, pedantic book. The style is lively throughout. The book has three main targets. The first is the idea, popular among many educators, that American children are almost perpetually at psychological risk and that such seemingly innocuous games like dodge ball and "It" must be banned for fear of creating permanent psychological damage. These are replaced by activities like juggling scarves which "lessens performance anxiety and boosts self-esteem" (p. 13) in the words of a California teacher. Thus anything that might cause psychological discomfort should be banned from the school curriculum. This results in elimination of scholarly prizes and competition because the losers might feel bad. Well, losers *ought* to feel bad when they lose something important. This is a motivation to try harder the next time out.

Echoing Salerno's discussion of the self-esteem myth, S&S note a call for school lessons that "instill in each child a sense of pride in his or her heritage" and "develop a feeling of self-worth" (p. 38), this from California rules on classroom content. The result of this is classroom content that views history through rose-colored glasses where no culture ever did anything wrong, and all are noble and brave. Thus, one is forbidden to speak of, or at least condemn, actions of other cultures. For example, the evidence of cannibalism by the Anasazi Indians is never discussed because it might upset students. This type of "happy-talk history" and the refusal to make moral judgments about different cultures has led to predictable results. One commentator, cited on page 43, finds fewer and fewer students willing to condemn the Holocaust. Doing so, of course, would be a violation of the ethic of multiculturalism in which no moral judgment can be made on the behavior of another culture, no matter how vile that behavior may be.

The belief that students are at great psychological risk leads to calls for programs to increase self-esteem, and here S&S closely parallel the content of Salerno's book, albeit with greater emphasis on citation of sources and a more thorough discussion. But the conclusion is the same: emphasis on students' self-esteem over and above actually teaching them something is doing no good in American classrooms.

To the extent that it succeeds, the self-esteem movement is producing children, and later adults, unfit to deal with the everyday realities of modern life. By shielding kids from distress, anxiety, competition, feelings of inadequacy, and the like, the movement is producing a generation of whiny little crybabies. Certainly those of us teaching at the university level see this often enough in students who whine, cry, and complain to anyone who will listen when they do poorly academically rather than just sit down and work harder.

A second theme in the S&S book is also one found in Salerno, the claim that bad behavior is due to some "disease" and therefore the individual should not be held responsible. S&S's discussion of this issue is much more sophisticated

than Salerno's. They clearly recognize that there are biological reasons for addictions but argue convincingly that this does not absolve individuals from the consequences of their own actions.

The final theme in S&S is one that Salerno only touches on tangentially. This is the recent huge growth of the grief industry and the claim that the intervention of grief counselors is required for people to overcome normal responses to trauma and loss. The grief industry consists of the hoards of often only minimally trained grief counselors that show up like vultures at every tragedy demanding that everyone involved "get in touch with their grief," "vent their feelings," and similar psychobabble. S&S make the important point that to expand its market, the grief industry has defined as needing counseling many who are not actually harmed in some tragedy. This includes bystanders who were no doubt upset by whatever happened, but not directly harmed. Thus, after the September 11, 2001, attacks, hoards of grief counselors converged on New York City like vultures on a corpse, dispensing their unctuous psychobabble. Here at Pace, the University Counseling Department sent around a memo to faculty stating that when discussing the attacks, we should *not* tell students to "be strong." The implication was that we should encourage students to "get in touch with their feelings." In other words, whimper, wallow in sadness, and not get on with life. Nor was this nonsense unique to Pace; S&S found the same advice popping up at other schools.

S&S point out that, terrible as the terrorist attacks were, they did *not* result in waves of suicides, increased rates of mental illness, and the like, all of which were predicted by the professional hand-wringers who consistently underestimate the strength of the American public. They also point to the growing body of evidence that grief counseling, especially the type that forces people to re-experience the traumatic event, not only isn't helpful but is harmful. In fact, if left to themselves and existing social support, most people will get over the effects of the event with no intervention. For those who truly suffer from post-traumatic stress disorder, cognitive-behavior therapy has been shown to be effective. This book is a powerful antidote to the trend toward responding to crises by whining and whimpering.

Let me give Salerno the last word here: "Today as never before—given the genuinely apocalyptic threats unfolding around us—Americans have an obligation to themselves, their families, and society to quit whining, stop comparing notes on who is more diseased, addicted, or dysfunctional, and just get down to business" (p. 141).

The Virtues of Skepticism

DAVID LUDDEN

Science Friction: Where the Known Meets the Unknown. By Michael Shermer. Henry Holt, New York, 2005. ISBN 0-8050-7708-1. 297 pp. Hardcover, $26.

One of the most interesting things about Michael Shermer's writings is the eclectic array of subjects he brings to skeptical literature. His latest book, *Science Friction: Where the Known Meets the Unknown*, is a pastiche of fourteen articles, most of them previously published. The subjects range from cognitive illusions to pop psychology, from evolutionary psychology to chaos theory, and from Gene Roddenberry to Stephen Jay Gould. However, if there is one theme tying this hodgepodge of essays together, it is expressed in the title of chapter 4: "The Virtues of Skepticism."

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Shermer sees skepticism as a general approach to understanding the world. In this sense, skepticism is equivalent to the scientific method, which gives us a way of distinguishing what is most likely fact from what is most likely wishful thinking. For example, in chapter 6, "Psyched Up, Psyched Out," Shermer explores the difference between applied and experimental psychology. Applied "self-help" fields, such as sport and clinical psychology, are based on anecdotal evidence and untested ideas. When the desired result is achieved, the technique is deemed successful, but failures are summarily dismissed because "this stuff [only] works when you work it" (p. 99). The only way to determine whether an intervention is truly effective is to compare the performance of an experimental group that receives the intervention against the performance of a control group that does not receive the intervention; in other words, we need to apply the scientific method.

Shermer also argues that the scientific method should be extended to other areas of inquiry, and several chapters in the book deal with the role of science in the study of history. For instance, in chapter 9, "Exorcising Laplace's Demon," Shermer proposes that the recently developed field of chaos theory in mathematics can provide a useful model for understanding the causes of historical sequences of events. Chaos theory describes a class of functions whose output is highly dependent on initial conditions; the output appears chaotic but is completely deterministic. Shermer calls his chaos-theoretic approach to history *the model of contingent-necessity*, which views history as

mainly dependent on contingent or arbitrary initial events that then have necessary consequences.

In the chapter that follows, Shermer applies this model of history to several historical counterfactuals, such as if the South had won the Battle of Antietam and if the Neanderthals had survived and *Homo sapiens* had gone extinct. The bottom line is that present circumstances are not inevitable; if not for certain improbable events in the past, the current situation would be much different.

Both chapters are thought-provoking but highly speculative, and Shermer admits that "there is considerable risk in weaving plausible histories with instruments from another science" (p. 131). The key is to approach these topics with a skeptical frame of mind, open to the possibilities but holding out for more evidence.

For Shermer, skepticism is virtuous not only because it can guide us toward a better understanding of the world but also because it can guide us toward a more humane way of living. This is important, because skeptics need to adequately address the claim that only religion can provide a moral foundation. With no predetermined moral code, skeptics must decide right from wrong on a case-by-case basis. However, this does not mean that skepticism inevitably leads to hedonism; on the contrary, it can lead the skeptic to making humane, ethical decisions. Shermer illustrates this in chapter 7, "Shadowlands," in which he relates the final months of his terminally ill mother. Rather than chasing after a miracle cure for his dying mother, he and his father decided that the best thing they could do was to accept "the ultimate fate of all flesh" (p. 106) and spend as much quality time with her as possible. Not everyone will agree that it is ethical or compassionate to stop seeking a cure, no matter how unlikely, for a dying loved one, but I was convinced—indeed moved—by this rational decision.

A secondary theme that runs through several of the chapters is what Shermer calls "Darwin's Dictum," namely that "all observations must be for or against some view if they are to be of any service" (p. 71). Darwin understood that science is driven by theory, not the indiscriminate collection of data. Science moves tentatively forward; many theories are proposed, but only those theories that are supported by the data survive, while those that are not supported die out, in a process akin to natural selection. In chapter 3, "Heresies of Science," Shermer discusses six recently proposed theories that are not generally accepted by scientists, such as those of multiverses, regenerative nervous tissue, and cancers caused by viruses. Most people learn science as dogma, which is why the Religious Right feels justified in calling science "just another religion" and why postmodernists feel justified in calling science "just another text." Hence, calling these outlandish proposals "heresies" is apt. But herein lies the difference between science and religion: the scientist is merely skeptical of unconventional ideas, whereas the believer feels compelled to squash them.

Darwin's Dictum also elucidates the troubled relationship between science and the popular media. In chapter 5, "Spin-Doctoring Science," Shermer relates the battle of the Yanomamö. Anthropologists Napoleon Chagnon and Kenneth Good have painted quite different pictures of the Yanomamö, with Chagnon calling them the "fierce people" while Good describes them as generally peaceful and loving. Here is Darwin's Dictum at work: each scientist has taken a particular point of view and has made observations to test that view. The debate is not really about whether the Yanomamö are fierce or loving, but rather about the relative influence of genetics and environment on human behavior in general.

However, journalist Patrick Tierney is confused about the real point of this debate. In his book *Darkness in El Dorado: How Scientists and Journalists Devastated the Amazon*, Tierney argued that the Yanomamö are not unusually fierce and that instead Chagnon was simply projecting his own violent nature on these people. Tierney expected Chagnon's detractors to praise his work because he thought his spin on the data was similar to their interpretation. Instead, he got nearly universal condemnation from the American Anthropological Association for misrepresenting the issues in this debate. Although scientists make observations to test the theories they believe to be true, those theories stand or fall based on the evidence. Spin doctors, on the other hand, pick and choose facts to support their favored points of view, and evidence to the contrary is ignored. All too often, journalists attempt to spin-doctor science, often focusing on superficial issues, which is a great disservice to the general public interested in knowing about recent scientific developments.

By far, the most important chapter is chapter 11, "The New New Creationism." First, Shermer examines the (ironic) evolution of creationism through several mutations into its current form, intelligent design (ID), in response to an unsympathetic justice system. Second, he provides rebuttals to major ID arguments. This section is extremely useful, because the arguments are crafty and so complex that only experts in mathematics, physics, and microbiology can accurately refute them. Shermer is unequivocal about the duplicity of ID proponents, stating: "Make no mistake about it. Creationists do not want equal time. They want all the time. Theirs is a war on evolution in particular and science in general, and they are as fanatical in their zeal as any religious movement" (p. 198). Here is Michael Shermer at his best, exposing the fraudulence of the creationist movement and the vacuity of its arguments. Indeed, this chapter alone is worth the price of the book.

The fourteen articles collected in *Science Friction* are of uneven quality. Several, such as "The New New Creationism" and "Psychic for a Day," are real gems, as is the introduction, "Not Knowing." Many, such as "Darwin on the *Bounty*" and "Exorcising Laplace's Demon," are thought-provoking but not completely satisfying, but only "History's Heretics," which is mainly just a list of lists, is disappointing. Overall, *Science Friction* is a worthy addition to any skeptic's library.

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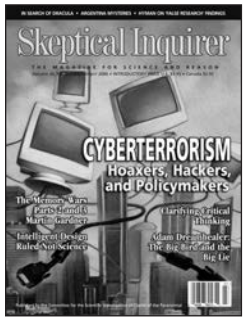
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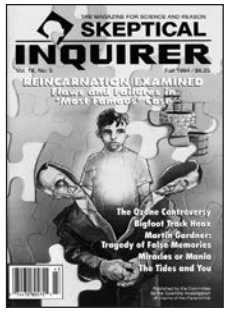

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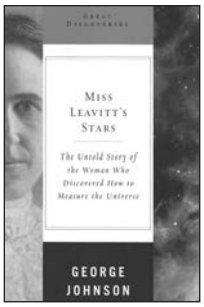


Hubble Wouldn't Be Hubble without Her

GREG MARTINEZ

Miss Leavitt's Stars: The Untold Story of the Woman Who Discovered How to Measure the Universe. By George Johnson. New York: Atlas Books, W.W. Norton & Company, 2005. ISBN 0-393-05128-5. 162 pp. Hardcover, $22.95.

In the preface to his short biography of Henrietta Swan Leavitt, the sixth in the Great Discoveries series published by W.W. Norton, George Johnson admits to the incompleteness of the portrait he paints of this largely forgotten giant of twentieth-century astronomy. "Henrietta Swan Leavitt deserves a proper biography," he writes. "She will probably never get one, so faint is the trail she left behind."

Because she left behind only scant letters, no personal diary or journal, no memoir, and only two known photographs, this neglect of Miss Leavitt seems less an outcome of the marginalization of women in science than the inevitable result of her starving biographers of the materials they need to function. Johnson writes that he had intended to use her as a device to begin his story of the incremental moves made by astronomers to discover and measure the cosmos beyond the Milky Way. (Indeed, the promotional materials that announced the launching of this series projected this volume as a biography of Edwin Hubble.) But Johnson found that she was so pivotal to the story of the measurement of the universe that he had to make her the focus of his tale.

It is a focus she deserves. She was hired by the director of the Harvard College Observatory, Edward Pickering, in 1902, after seven years of volunteer work at the observatory. Her appointment to the permanent staff brought her the plum salary of thirty cents an hour, a nickel more than the other members of "Pickering's harem," a group of women who did the extremely precise and extraordinarily tedious task of measuring and cataloging the brightness, color, and position of each star in the tens of thousands of glass photographic plates that Harvard astronomers were collecting.

The task of organizing these repetitive and fragile plates was left to women, not only because of their supposed strength of concentration but because they were cheap labor. There was never any intention of allowing them to work in any capacity that might engage them in theory, or even the use of imagination or insight. Leavitt, through her demonstrated brilliance, rose above these pointless limitations to produce an insight into the relative luminosity of a particular class of variable star called Cepheid variables.

Her obsession with these bodies, which vary in brightness in periods lasting from days to weeks, led to a revolutionary insight into the measurement of the universe. With the huge number of images available to her, she was able to trace the patterns that revealed that the rate of variation of a Cepheid was an accurate measure of its actual brightness. By comparing the apparent brightness of these stars against their actual luminosity, one could work out the distance to any Cepheid variable. This yardstick, called the Cepheid variable period-luminosity relationship, or Henrietta's Law, allowed for the measurement of the distances between other stars and objects.

The significance of this was breathtaking. With Miss Leavitt's yardstick, astronomers like Edwin Hubble could prove that there was a universe more vast and varied beyond our Milky Way. Before her work allowed for a definite method of measurement, there was a pitched battle between those who advocated an enormous universe with those who posited an idea of a smaller, more compact universe with little or nothing beyond our galaxy.

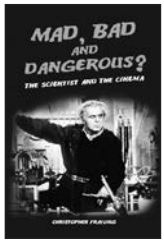
After Hubble's brilliant application of Leavitt's Law to discover galaxies and stars millions of light-years away, astronomy eventually went on to measure an expanding universe, a discovery that inevitably led to the Big Bang theory. It is difficult to overstate the importance of her discovery to modern astronomy.

Johnson weaves an absorbing tapestry of the colorful personalities and events in which Miss Leavitt played such an important role. What disappoints, inevitably, is how little of her there is in this story. We learn that she suffered recurring bouts of long unnamed illnesses that would take her away from her beloved variables for years at a stretch. One such stretch, shortly before her hiring at Harvard, led to near total deafness. What might otherwise have been a disability had little impact on a person of strong will and even stronger intelligence, and was hardly a problem for a person whose primary job duty was to sit silently, focusing on glass photographic plates. She lost more work time due to repeated absences to care for other ill and dying relatives. Miss Leavitt succumbed to her final illness, stomach cancer, in 1921, at the age of fifty-two.

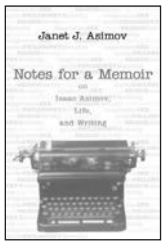
If she chafed under the cramped role she was allowed to play in the Harvard Observatory, we have no details of her struggles. What it was like for her, possessed of such a brilliant mind and accomplishing the kind of breakthrough that countless scientists have hoped for but never achieved, was apparently never shared with anyone. In spite of Johnson's excellent effort, she remains a cipher. But the enormous body of knowledge she granted us with her discovery is a fitting epitaph. She probably would have wanted it that way. □

Greg Martinez lives and writes in Gainesville, Florida. He can be reached at martineg66@yahoo.com.

Listing does not preclude future review.

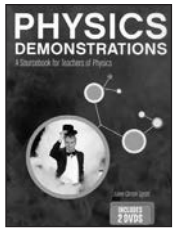


***Mad, Bad, and Dangerous? The Scientist and the Cinema*. By Christopher Frayling**. The University of Chicago Press. Chicago, Illinois, 2005. ISBN 1-86189-255-1. 256 pp. Hardcover, $35. It's no secret that scientists are often poorly represented in films. For every film like *Contact*, *Outbreak*, or *The Dish*—depicting working scientists trying to expand humanity's knowledge or save lives—dozens of others show scientists as lab-coated madmen wreaking catastrophe. Christopher Frayling, author of books on vampires and cinema, examines the scientist role in the history of film. Drawing on dozens of examples ranging from *Metropolis* to *Dr. Strangelove* to *The Nutty Professor*, Frayling argues that the cinema's (and therefore much of the public's) view of scientists has been shaped by cultural fears and anxieties. An interesting and thorough (if at times pedantic) analysis of the origin of this caricature.



***Notes for a Memoir: On Isaac Asimov, Life, and Writing*. By Janet J. Asimov**. Prometheus Books, Amherst, New York, 2006. ISBN 1-59102-405-6. 220 pp. Hardcover $25. A series of interesting notes and thoughts, mainly, says the author, "about the human imagination, the sense of identity, the compulsion to write, and Isaac Asimov, who was good at all of them." Janet Asimov was Isaac's wife, a psychiatrist and a writer in her own right, and the book is also about her and includes a few of her stories and articles. It deals with large subjects such as religion, philosophy, sex, and lighter subjects such as traveling together, camping, the golden thirties, the fun of reading, and the problems and joys of writing. Little details illuminate their thinking. They both found it amazing how many people stand in long lines with nothing to read; they always carried science articles or paperback novels for such occasions (and she still does). As for Isaac's combined interests in fantasy and science, Janet says Isaac once said to her: "Yes, Science, as the great fantasy of our time— the first fantasy made real! I must use that some day." She comments: "That's the idea—enjoying the imagination (one's own or that of others) and *using* it."

***The Oracle: The Lost Secrets and Hidden Message of Ancient Delphi*. By William J. Broad.** The Penguin Press, New York, 2006. ISBN 1-59420-081-5. 304 pp. Hardcover $25.95, The ancients said the Oracle of Delphi regularly inhaled sacred vapors streaming from the depths of her temple. But in 1892 French archaeologists unearthed the temple and found no evidence of a chasm from which the vapors might have emitted, and after that scholars denounced the Oracle as a fraud. Now the accomplished *New York Times* science reporter Bill Broad chronicles the investigation by Wesleyan geologist Jelle deBoer and archaeologist John Hale, who eventually determined that the ancient fumes were petrochemical vapors containing a hallucinogenic gas—ethylene—emitted from natural faults hidden beneath the temple floor. Their paper, "New Evidence for the Geological Origins of the Ancient Delphic Oracle (Greece)," was published in *Geology* in August 2001. Broad entertainingly tells the story of their discovery, weaving in ancient findings and modern philosophical discussions about science and religion. The discovery solves the mystery of how the Oracle got high, yet Broad feels that the larger questions, "the surrounding layers of mystery," remain. He notes the need for skepticism about psychic powers but argues against overly narrow scientific reductionism that may blind scientists to larger mysteries.



***Physics Demonstrations: A Sourcebook for Teachers of Physics*. By Julien Clinton Sprott.** The University of Wisconsin Press, Madison, Wisconsin, 2006. ISBN 0-299-21580-6. 288 pp. Hardcover, $45. There are several ways to teach children about science. One method is to set the kids down in a classroom, talk at them about gravity and vacuums and Bernoulli's principle, and watch the eyes glaze over and the heads droop in bored stupor. This is a common and time-tested method virtually guaranteed to nip most junior scientists in the bud. Another way is to show kids how truly amazing science is, with a book such as Julien Sprott's *Physics Demonstrations*. Teachers can entertain students while teaching them with flames, flying objects, and levitation. The text offers step-by-step demonstrations of principles in heat, motion, sound, electricity, light, and magnetism. For example, "A dripping faucet illustrates periodic and chaotic behavior and the period-doubling route to chaos." The "period-doubling route to chaos" sounds like pretty heady stuff, sure to intrigue kids of all ages! Materials, precautions, and principles are discussed as well. Complete with two DVDs featuring 85 demonstrations, *Physics Demonstrations* should be on every physics teacher's shelf.

***Science and Nonbelief*. By Taner Edis.** Greenwood Guides to Science and Religion, Greenwood Press, Westport, Connecticut, 2006. ISBN 0-313-33-78-6. 312 pp. Hardcover, $65. Physics professor Taner Edis, co-editor of *Why Intelligent Design Fails*, here chronicles the long history of the battle between adherents of religious doctrines and the nonbelievers who adhere to the naturalism of modern science. He concentrates on what he calls "science-minded nonbelief." Sections deal with Science, Philosophy, and Religious Doubt, An Accidental World, Darwinian Creativity, Minds Without Souls, the Fringes of Science, Explaining Religion, and Morality and Politics. Several provocative "primary sources" on the topic by authors such as Steven Weinberg, Richard Dawkins, Susan Blackmore, and Pascal Boyer are also reprinted in a section at the end. Good reading for everyone interested in the complex questions surrounding whether science and religion can co-exist.

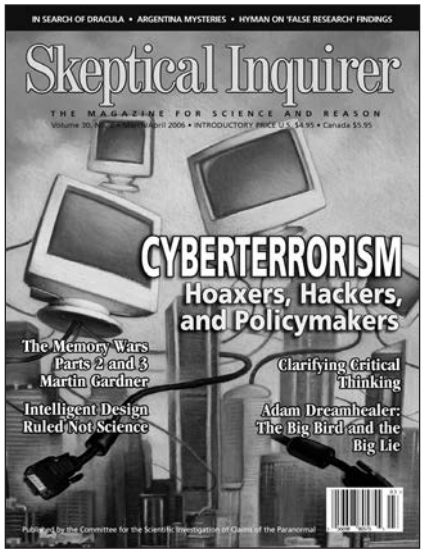
— Kendrick Frazier and Benjamin Radford

SCIENCE BEST SELLERS

Top Ten Best Sellers

1. ***How to Grow Fresh Air: 50 Houseplants That Purify Your Home or Office***
   B.C. Wolverton
2. ***Foundations and Fundamental Concepts of Mathematics***
   Howard Eves
3. ***The Road to Reality: A Complete Guide to the Laws of the Universe***
   Roger Penrose
4. ***Concepts of Modern Mathematics***
   Ian Stewart
5. ***Calculus: Early Transcendentals***
   James Stewart
6. ***The Second* Scientific American *Book of Mathematical Puzzles and Diversions***
   Martin Gardner
7. ***Breaking the Spell: Religion as a Natural Phenomenon***
   Daniel C. Dennett
8. ***Us and Them: Understanding Your Tribal Mind***
   David Berreby
9. ***What Is Mathematics?: An Elementary Approach to Ideas and Methods***
   Richard Courant, Herbert Robbins, and Ian Stewart
10. ***Symmetry and the Beautiful Universe***
    Leon M. Lederman and Christopher T. Hill

By arrangement with *Scientific American* (www.sciam.com), March 2006.


IN SEARCH OF DRACULA • ARGENTINA MYSTERIES • HYMAN ON 'FALSE RESEARCH' FINDINGS
Skeptical Inquirer
THE MAGAZINE FOR SCIENCE AND REASON
CYBERTERRORISM
Hoaxers, Hackers, and Policymakers
The Memory Wars Parts 2 and 3 Martin Gardner
Clarifying Critical Thinking
Intelligent Design Ruled Not Science
Adam Dreamhealer: The Big Bird and the Big Lie

Paranormal Beliefs Survey

The findings of Bryan Farha and Gary Steward Jr.'s "Paranormal Beliefs: An Analysis of College Students" (January/February 2006) were, indeed, surprising at first blush.

However, higher education, rather than being "in the business of promulgating critical thinking and skepticism," is in the business of providing students and employers what they want, primarily, and what they need, secondarily. Thus, since higher education is optional and costly, curricula are in a large part market-driven rather than based on an idealized vision of "academe." Farha and Steward's examples of dubious areas of study sanctioned by institutions of higher education support this economic rather than academic thrust driving curriculum design.

What do students want? Well, jobs, for one thing, and a broad sense of liberalism or openness, for another. That's not easily defined as the erasure of prejudgments, the willingness to accept differences. Open-mindedness is, of course, a cornerstone of skepticism. Yet, too often, this idea is stretched to mean "willingness to uncritically accept every cockamamie idea that comes down the pike." Being critical is mean-spirited and, well, just not nice.

Then it's not surprising at all to see skepticism diminish as students progress through higher education. As they become indoctrinated into the belief system, they become more willing to accept other people at face value (a good thing) and more willing to accept, without questioning, ideas which don't stand up to rigorous scrutiny (not a good thing). Therefore, it's not at all surprising that students in the social sciences showed stronger paranormal beliefs than others.

It remains to be seen whether global market pressures will drive the higher education market toward more critical thinking.

John Smith
New Berlin, Wisconsin

I found "Paranormal Beliefs: An Analysis of College Students" very interesting, as well as disturbing. (Fifty-seven-percent belief in astrology among college students, compared to 52 percent shown in the Gallup Poll!) However, in my opinion, positive responses to some of the original Gallup survey questions—evidently used again by the authors so that the results could be compared—do not necessarily indicate paranormal beliefs.

For instance, the survey asked about "psychic or spiritual healing *or* [emphasis added] the power of the human mind to heal the body." Surely, the placebo effect shows the "power of the human mind to heal the body." Another question involves belief "that extraterrestrial beings have visited Earth at some time in the past." Since it is quite possible that aliens have stopped by our planet at some point (perhaps long before the appearance of humans), a skeptic could reasonably give the answer "not sure." And finally, a belief in "witches" can easily be confirmed through a simple Internet search on the Wiccan religion.

I wonder if different wording for these questions would have produced results more indicative of skepticism among the students. At least I hope that many of the 55 percent professing belief in witches don't truly believe they can cast supernatural spells.

Patricia Linderman
Falls Church, Virginia

As a long-time skeptic, I am always skeptical of survey results, since the answers can be greatly affected by slight variations in the wordings of the questions. Your survey of paranormal beliefs is a great example of this. The very first question asks about belief in "Psychic or spiritual healing or the power of the human mind to heal the body." While skeptics easily dismiss psychic or spiritual healing, the power of the mind to heal the body is well-established scientifically. There aren't many doctors who don't regard their patient's attitude as significant in the healing process. And the placebo effect is well documented and very significant. In fact, the real effects of mental processes on the body are most likely the explanations for many of the observations that people attribute to psychic or spiritual healing.

I am a proud (maybe arrogant) skeptic who likes to ridicule paranormal beliefs as much as the next SI reader, but I would be forced to answer "believe" to the first survey question because of its poor wording. While it is fortunate that none of the other questions seemed to suffer from such ambiguity, there isn't much insight to be gained from the first question. Maybe that is why the first question is the only one in the survey that had a greater than 50 percent "believe" response.

Chris Mack
Austin, Texas

The first question of the survey asked the subject to choose "Believe," "Not Sure," or "Don't Believe" for "Psychic or spiritual healing or the power of the human mind to heal the body." Given the subject, I thought I would respond with "Don't Believe" to all questions, but I realized that the first question included the placebo effect, a well-established scientific fact for fifty years, despite recent reports questioning it. Spiritual healing is a gray area, because the placebo effect extends to any arena in which the patients "believe" they will be healed.

The ambiguity and multiple interpretations possible of the first question muddies the conclusions drawn from the survey, because I would expect that as education level rises, respondents are more likely to be aware of such things as the placebo effect. I think it would have been very interesting and probably more revealing to know the reasons why people selected their response for the first question (rather than the actual response).

Craig Cleaveland
craig@craigc.com

The results are certainly disturbing. However, I wonder if the category "Psychic or spiritual healing or the power of the human mind to heal the body," which received the highest positive response of 56 percent (16 percent higher than any other response), may be slightly flawed. Psychic healing by a practitioner on patients is one thing, but the possible positive effects of the patients' own attitude/mind set are quite another. I wonder what the results would be if these two concepts were clearly differentiated instead of being apparently lumped together?

Ron Constable
Palmdale, California

I find it hard to believe that Farha and Steward's article on the paranormal beliefs of college students really represents a cross section of students. Texas and Oklahoma can hardly stand in for Amherst or Boston, Massachusetts, or New York City, let alone Berkeley, Southern California, or Chicago. I think you will find more skeptical, scientifically informed graduate students when you get out of the southwest central region of the U.S.

Angela Fina
Amherst, Massachusetts

Gary Steward Jr. responds:

We thank these readers for reading and responding to our article.

Fina's insight about geographical differences is correct. We did not intend to generalize to all college students and should have explicitly stated such. In fact, an obverse example that supports her contention is visible in the responses to six of the thirteen dimensions of paranormal beliefs. The responses to those six measures were far below the national (2001 Gallup) responses. Upon reflection, the most plausible explanation is the influence of conventional religion in this geographical area. We would not be surprised to find similar results in regions where conventional religion exerts a near-monopolistic influence.

Regarding the instrument, we agree with the observations of Linderman, Mack, Cleaveland, and Constable. Their astute observations related to the first item, "Psychic or spiritual healing or the power of the human mind to heal the body," is only the beginning of the problems with the instrument. The lack of discrete items and a response set that is problematic obfuscates reliability. As exploratory research, we adopted the 2001 instrument without any significant modifications with the intent of comparing college students in this region with a national sample. We have discussed a subsequent project that would include, among other things, a new instrument.

Smith makes an interesting comment related to the influence of market forces and the imposition of business priorities on higher education. We are weary of the claim that students are taught that critical thinking is "not nice." But his lament about the "bottom line" in all its variegated forms is warranted. The recent trend in many colleges and universities he describes is ostensibly "accommodation" to market demands.

Ethics of Investigation

Paranormal and pseudoscientific claims are perceived as inadequate evidentiary support. On this, I disagree with David Koepsell ("The Ethics of Investigation," January/February 2006), who framed his statements improperly.

One needn't examine whether extrasensory perception exists, for example, because all manner of things may exist as hypotheses. The proper question is whether *evidence* of ESP exists in external reality. If claimants could offer such evidence, I'm sure that science wouldn't need badgering to examine it. But absent such evidence, I see no ethical obligation to investigate endless and repetitive claims.

Paranormal and pseudoscientific claims never can be "ruled out" because no claim devoid of evidence can be properly tested or falsified. But recognizing this adds nothing to knowledge.

Koepsell wants science to "consider extraordinary explanations" for alleged phenomena when other causes are ruled out. If by "extraordinary," he means nonphysical or unnatural, he's beyond the realm of science, the essential principle of which is that material phenomena have material causes. In that sense, no natural phenomena, however unusual, would be extraordinary.

As for the risk that exposure may subject charlatans to retribution, I'd say that such is the just reaping of their duplicity. Science should operate dispassionately, for truth and falsity are innocent of ardor. Save compassion for the victims of deception.

William S. Bunn
Algonac, Michigan

I found David Koepsell's article on scientific ethics interesting, but would like to expand on his section on equipoise, the attitude of objectivity and avoidance of prejudice.

One of the triumphs of science in our time is the recognition that pure equipoise is not humanly possible, and even were one researcher to achieve it, another researcher could still challenge the research outcome on the basis of a possible lack of it. Researchers have developed elaborate research methodologies—notably double blinding, control, randomization, repeatability, openness, statistics, complete reporting—specifically to factor out researcher bias.

And as the "Alpha Kids," Steve Shaw and Michael Edwards, remind us, scientists are generally culturally honest and don't possess expertise in investigating deception. Advisory conjurers augment the toolbox with various forms of security.

Each of these methodologies must be adapted to each field of research in unique ways, as the experimental methods available to physics, for instance, may be quite different from those available to archaeology. But in all cases, equipoise is no longer seen as an achievable goal, and elimination of influence by the investigator is substituted.

Matthew H. Fields
Ann Arbor, Michigan

Darwin's Burial

In "Why Did They Bury Darwin in Westminster Abbey?" (January/February 2006), R.G. Weyant falls into the common trap of considering a theory as something less than scientific when he writes (on page 33): "Moreover, by the time of Darwin's death, for most Englishmen, evolution was not just a *theory*—the evidence in its favor was simply overwhelming" (my italics).

But that's exactly what you create when you have overwhelming evidence: a theory. The author fell into the trap that was highlighted in David Morrison's article, "Only a Theory?" (SI, November/December 2005).

Carlos A. Altgelt
Martinez, Argentina

Memory Matter

I was startled to read Martin Gardner's claim ("The Memory Wars," January/February 2006) that Pamela Freyd and her husband "were falsely accused by their daughter of sexually molesting her when she was a child." Maybe I am just a skeptic, but I doubt that Gardner is in a position to know whether the allegation is true or false. Is he perhaps claiming some kind of paranormal access to events that happened in the past?

Mr. Editor, exercise a little more skepticism, please!

Douglas Hintzman
Professor Emeritus
Department of Psychology
University of Oregon
Eugene, Oregon

Martin Gardner responds:

Professor Hintzman has a point. I was expressing a strongly held opinion based on the overwhelming evidence of how easily therapy can fabricate false memories, together with my inability to conceive that Pamela and her husband Peter are unconscionable liars.

Ogopogo

Joe Nickell's Investigative Files: "Ogopogo: The Lake Okanagan Monster" (January/February 2006) was a thoroughly delightful read for me. My first recollection of Ogopogo was as a young boy in Prague, Nebraska, where my Uncle Bob and Aunt Blanche had a wind-up Victrola record player and a record of "Ogo Pogo" (viz.) by Paul Whiteman and his orchestra. Will the original Whiteman spelling present a problem in scientific orthography? I had been under the impression that the term *Ogopogo* was not of Native American origin, but had never found proof.

An Internet search shows that Whiteman recorded "Ogo Pogo" on July 2, 1925, in New York City on a Victor disk. Whiteman's rendition provided a "phylogeny" of Ogo Pogo: "Its Mother was a pollywog, its Father was a whale," the only part of the song I remember over sixty years later. Much to my surprise and joy, I found the song and the above information at www.redhotjazz.com/pwo.html.

SI readers may enjoy listening to it.

Roger K. Pabian
Conservation and Survey Division
University of Nebraska
Lincoln, Nebraska

Contradictions?

In his article on Kevin Trudeau ("What 'They' Don't Want You to Know," January/February 2006), Stephen Barrett's comments seem to contain a few contradictions.

On page 53, he writes: "The realistic view is that the drug industry could not succeed unless it produces safe and effective products." He then goes on to say that Trudeau sold "products whose sales totaled hundreds of millions of dollars" (page 54), "Even though all homeopathic products are worthless, the FDA permits products . . . to be sold" (page 54), and "no homeopathic product is effective against depression or cancer" (page 55).

So it seems that while the drug industry can only succeed by honest means, the Trudeaus, homeopaths, and all the other quacks, liars, and cheats can do nicely for quite a long time. Isn't it just possible that the drug industry might use similar means to succeed, even if Barrett doesn't think so?

Charles F. Hruska
Brooklyn, New York

Intelligent Design

Something worthy of criticism and further examination in the fuss over intelligent design/creationism (see SI, November/December 2005 and March/April 2006) is the claim often made by Christian fundamentalists (especially in the U.S., I believe) that Darwinian, or neo-Darwinian, evolution is materialistic and constitutes purposeless, hence godless, materialism.

I submit that the reification of Bible stories and accounts by Christian fundamentalists is an automatic tendency toward materialism on their part. Their way of thinking is perforce materialistic, and that is why this issue "gets them" so strongly. God must manifest himself to them in such a way. The scientific approach, of hypothesis and theory, is too abstract. Darwin's description of the mechanisms of evolution and of the origin of species entails a complex sequence of ideas under the aegis of the principle of cause and effect.

This is just too much for them, too much abstraction for them, and the putative benevolent, bearded gent pulling the stings like a puppet master is a material reality that they can well imagine, one that they can concretize, so to speak. Such people live in a naïve, material reality all the time. Reification is natural to them and automatic. They are as materialistic as one can be, and at a fundamental level of thought at that.

I can only hope to read some better analysis and explanation of this someday in the SKEPTICAL INQUIRER. By the way, my knowledge of the American propensity to reify comes from Geoffrey Gorer's excellent *The American People: A Study in National Character*, a truly wonderful piece of anthropology, and a very useful aid for this skeptic.

Anthony Gumbrell
Seattle, Washington

The basic premise of intelligent design is that the complexities of the universe demand a carefully unnamed intelligent designer whom I'll call the Greatly Overrated Designer, or G.O.D. One of the favorite phrases of ID is "irreducible complexity," and surely, that would apply to G.O.D., implying that he must have been designed in turn by another intelligent designer, who, of course must have had his own intelligent designer, and so on, *ad infinitum*.

Most ID proponents would argue that the designer is necessarily more complex than anything he designs. That means that G.O.D is infinitely far down the chain of complexity, somewhere on the level of a summer intern's little brother. While the image of God creating Adam out of dust is satisfyingly awesome, the sad spectacle of some low-level shlub doing his feeble best is considerably less so.

This is a simple argument that most people grasp, and it shows that ID implies an infinite regression of ever more complex gods, making G.O.D. greatly overrated indeed. No wonder ID proponents refuse to discuss who or what the intelligent designer might be.

John G. Bentley
N5bentjohn@aol.com

I thought readers of the SKEPTICAL INQUIRER would be interested in a recent "debate" about creation science.

In response to an excellent feature (Origins) in *The Indianapolis Star* newspaper, comparing creation science, intelligent design, and evolution, I wrote a letter to the editor. I reminded readers that there are many more creation stories from past cultures and religions, and concluded that evolution was the only one that was substantiated by science and suitable for the science classroom. The others should be taught at home or in religious schools.

The day my letter was published, I received a telephone call from a disturbed local creationist. Rather than hang up on the agitated caller, I listened until he ran out of insults. I finally managed to ask him if his verbal abuse of me was a Christian thing to do. He called me "a fascist, a racist, an idiot, and an ignorant, arrogant, atheist," among other things. He was right about the atheist part. He replied that it was his Christian duty to defend his religion any way he could. I was astounded when he said I had "no right to express my opinion and the newspaper had no right to publish it."

Over the course of the next forty-five minutes, my caller repeated the old

discredited creationist arguments about thermodynamics, lack of helium, absence of transitional fossils, lack of Precambrian fossils, shrinking of the sun, disagreement among evolutionists, etc. He often repeated that, "Creationism is a true science and evolution is a false theory." Thanks to many related articles in the SKEPTICAL INQUIRER, I refuted all his nonsense in a calm and polite manner, until he finally hung up in a rage.

I realize my responses to his claims were unlikely to dissuade him of his fundamentalist beliefs, but I must admit that I was pleased to be able to respond factually to everything he said, thanks to your wonderful publication.

Craig Gosling
Indianapolis, Indiana

Friday the 13th

A recent mailing I received from CSICOP included this statement: "An English schoolboy allegedly proved mathematically that thirteen, when examined over a 400-year period, falls on Friday more than any day of the year."

Literally, this is not correct, however. If the thirteenth day of the month falls on a Friday, then so will the sixth, the twentieth, and the twenty-seventh, of course. What was really meant is that the thirteenth day of the month falls more often on a Friday than on any other day of the *week*.

I wrote a small computer program to check this. And indeed, the statement made by that schoolboy is correct. During the years 2001 to 2400, the 13th falls 687 times on a Sunday, 685 times on a Monday, 685 on a Tuesday, 687 on a Wednesday, 684 on a Thursday, 688 on a Friday, and 684 on a Saturday. So indeed, Friday is the most frequent day of the week for the 13th, but only just.

I did a similar calculation for the old Julian calendar. While in the Gregorian calendar, the weekdays repeat on the same days of the year after 400 years, in the Julian calendar, the periodicity is twenty-eight years. Surprisingly, in this calendar, the thirteenth day of the month falls with exactly the same frequency on each day of the week: forty-eight times each in a period of twenty-eight years.

Jean Meeus
jMeeus@compuserve.com

Sgt. Pepper Patch

In Massimo Polidoro's January/February 2006 Notes on a Strange World column, he writes: " . . . [Paul McCartney] also offered a number of explanations for the mysterious clues. The OPD (*sic*) patch he wore on *Sgt. Pepper's* actually meant "Ontario Police Department. . . ."

Polidoro appears to be presenting McCartney's explanation for the patch, rather than offering an explanation of his own, so the error is likely on McCartney's part. It does need to be pointed out, though, as evidence of the extent to which conspiracy mongers will clutch at straws.

The patch on the album cover is plainly that of the OPP, the Ontario Provincial Police. It can be seen in the top left corner of the page at www.opp.ca/welcome/english/ and most other pages on the site. A larger version may be seen at http://policecanada.ca/Canada/Ontario/OPP/.

On the album cover, the second *P* is partially obscured, but still recognizable.

Ted Powell
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Uri Geller

How could you write a piece on the recent activities of Uri Geller ("Geller Revisited," The Skeptical Inquiree, January/February 2006) without mentioning his activities in soccer? In May 2002, Mr. Geller took control of Exeter City, a club in the bottom division of the English league. A year later, at the end of the season, they had finished last and were thrown out of the league. I think it was "bad vibes."

Chris Torrero
Chessington, Surrey
U.K.

When Uri Geller was popular, I could hardly bear to watch him on shows like *The Mike Douglas Show*. His preposterous enthusiasm for bending spoons was too ridiculous to watch. He received his fifteen minutes of fame and more.

Uri sought publicity in any way he could find it, with anything from his bad parlor tricks to his bad music. I can see why he supports the decadence of Michael Jackson: his whole life was filled with falsehoods and trickery, his own decadence is shameful. To think that Marvel, the comic-book company that produces *Spider-Man*, even came out with a comic book guest-starring Uri Geller. Yuck!

Paul Dale Roberts
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Homeopathy/Hormesis

In a letter published in SI (January/February 2006), James Huff writes: "The concept of hormesis or homeopathy is based largely on empirical observations and does not adequately consider the underlying mechanisms of action."

Not so fast. Homeopathy is bunk, but that's not why. Hormesis and homeopathy are based not on empirical observations but on the idea of sympathetic magic—the assumption that "like produces/cures like." The empirical observations made in homeopathic studies are okay as far as they go but are irrelevant to the conclusions homeopaths draw from them.

It is not appropriate to even begin considering underlying mechanisms for an action which itself has never been shown to exist, and the existence of which contradicts a world of existing evidence. That's putting the cart before the horse, and not the way science works.

When science proposes an explanation, e.g., Einstein's 1915 paper on general relativity, it's an explanation for something that has already been found empirically, like Michelson and Moreley's 1880s finding of constancy for the speed of light. And the explanation becomes meaningful when it leads to testable hypotheses, like the light-bending effects of gravity, verified in the 1919 solar eclipse.

I will not address the rest of Huff's letter, but that one sentence sounds to me like an attack on science as well as homeopathy.

Matthew H. Fields
Ann Arbor, Michigan

On 'Darwin's Finches'

I am grateful to biology professor Richard Thomas of the University of Puerto Rico, among other colleagues, for calling attention to my sidestepping (to avoid too long an article) of an important issue in my SI article ("Obfuscating Biological Evolution," November/December 2005) that although Darwin's *On the Origins of Species* alludes to the finches,[1] he does not specifically mention them when he discusses the land birds of the Galapagos Islands. Darwin discusses the Galapagos finches in his *Journal of Researches*

(popularly known as *The Voyage of the Beagle*), in which he writes:

> . . . in the thirteen species of ground-finches, a nearly perfect gradation may be traced from a beak extraordinarily thick to one so fine that it may be compared with that of a warbler. I very much suspect that certain members of the series are confined to different islands. . . . Seeing this gradation and diversity of structure in one small, intimately related group of birds one might really fancy that, from an original paucity of birds in this archipelago, one species had been taken and modified for different ends.

The designation of "Darwin finches" came to be applied by later scientists because of the birds' importance to evolutionary studies, and also because the Galapagos finches played a significant role in Darwin's formulation of evolutionary theory. It will surprise many contemporary biologists that Darwin actually still operated under standard early-nineteenth-century "typological and creationist assumptions."[2] The evolution of biological evolution is already intricate enough not to obfuscate it further.

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Notes

1. Darwin, Charles. 1968 [1859]. *On the Origin of Species by Means of Natural Selection, or, The Preservation of Favored Races in the Struggle for Life*. London: Penguin Books [London: John Murray], 385–386.

2. Sulloway, Frank J. 1982. "Darwin and his finches: The evolution of a legend." *Journal of the History of Biology* 15(1): 1–53.

Nature vs. Nurture

The column by Massimo Pigliucci, "Is Evolutionary Psychology a Pseudoscience?," (March/April 2006) falsely asserts that *The Bell Curve*, by Herrnstein and Murray, makes claims about the "genetic determinism of human cognitive traits." Nowhere in the book do the authors make such claims. On the contrary, Hernstein and Murray suggest that both heredity and environment influence intelligence. For example, on page 311 of the book, they state: "It seems highly likely to us that both genes and the environment have something to do with race differences [in IQ test scores]." In fact, the position of Herrnstein and Murray on the matter of nature vs. nurture is remarkably similar to that of Steven Pinker in the excerpt of his book, *The Blank Slate*, that appeared in the March/April 2003 issue.

Prof. Pigliucci is simply repeating scurrilous politically correct gossip about the book.

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The organizations listed above have aims similar to those of CSICOP but are independent and autonomous. Representatives of these organizations cannot speak on behalf of CSICOP. Please send updates to Barry Karr, P.O. Box 703 Amherst NY 14226-0703.

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